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Aluminum Name Plates

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A NAMEPLATE, though adding nothing to the performance of a piece of equipment, is an important part of a manufactured product. It is the maker's signature, and by it he is definitely charged with responsibility for the success or failure of the article which bears his name.

Most manufacturers now consider it essential to use attractive nameplates on their products, on the principle that bright spots of color please the eye and attract it to the message, whether it be merely the name of the manufacturer or a set of instructions for the proper use and care of the equipment.

Nameplates of the horse-and-buggy era were quite often stamped and embossed and of one color only—the color of the metal. Occasionally they were enhanced by the use of paint and enamel. Today they are not only painted or enameled, but they are also lithographed, colored, etched, polished, electroplated, or otherwise decorated.

There are six general types of nameplates. They are made by engraving, stamping, coining, embossing, casting, and etching. In addition to these, a number of combinations have been developed, and—in the case of aluminum—at least one new process, which actually increase the list. From such an assortment it is possible to make an almost unlimited selection.

The engraved nameplate. Most aristocratic of the lot, from the standpoint of both heritage and cost, is the engraved nameplate. It is the oldest type of nameplate known, and also the most expensive, because all the work on it must be done by hand. It had its origin in the **nielli** which Renaissance goldsmiths made for the coffers of the rich. Small engraved plates of gold or silver were placed on shrines, caskets, and the like. In order to make the engraved lines more easily visible, goldsmiths filled them with a black amalgam of silver, copper, and lead, called **niello.** Hence the name. **Nielli** is the plural of the singular **niello.** Engraved nameplates, because of their cost, are usually only made singly.

The stamped nameplate. Where quantities of less than one hundred are desired, the stamped nameplate is the most economical. It is made by taking flat sheet and submitting it to the blow of a die which depresses the design into the plate. It has little or no artistic merit.

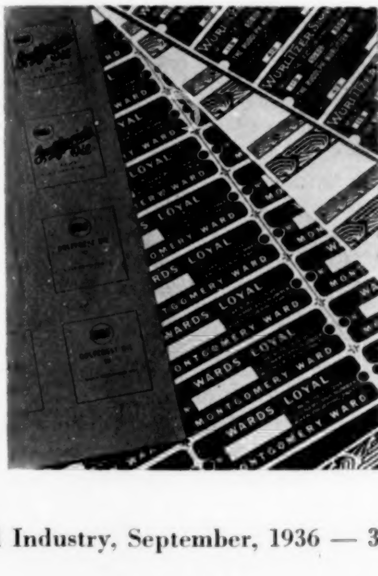

Fig. 1. Semi-Fabricated Aluminum Nameplates. The designs have been printed on large sheets, and the individual plates have not yet been separated by shearing. The sheet at the extreme left has been colored by the Alumilite process. The background is a brilliant orange, while the design is in a deep, rich blue. The others are standard two-color etched finishes in black and aluminum

The coined nameplate. On a coined nameplate, the design is raised. A coining die, like that used in the manufacture of money, strikes the flat sheet or plate, depresses the background and raises the design. The back of the sheet is usually flat.

The embossed nameplate. Cheaper than the cast or the coined nameplate, because less metal is used in its manufacture, is the embossed nameplate. It is quite imposing. Two dies are used in making it, a male die and a female die. The design on the front of the plate is raised, while on the back it is depressed and in reverse. The material is usually sheet, but the appearance is similar to that of a casting, with the exception that it is possible to produce more intricate detail and sharper design with the embossed nameplate.

The cast nameplate. While cast nameplates require more metal than plates made by other methods, they have the advantage of possessing a greater degree of dignity and substantiality, particularly where a large sign or tablet is desired. They are made by

Fig. 2. Name Plates Finished by the Alumilite Process

pouring hot metal into a mold, in the same manner in which other castings are produced. Where small quantities are desired, sand castings are more economical, but large quantities demand the use of dies and the plates are die-cast.

The etched nameplate. Etched nameplates are cheaper in large quantities, and therefore so many more of them are seen than of the other kinds. The etching of metal goes back into history many years. It is the invention of the armorers, who used it to decorate the swords and cuirasses of mediaeval knights, and who practiced this art as early as 1450. Just when it was used in the reproduction of prints is uncertain. Daniel Hopfer made some prints in 1504, and the first signed print of which there is any record was made in 1521 by Urs Graf, an engraver and woodcutter, who etched a drawing on iron, giving it a single bite with acid.

Etching was an ideal method for the reproduction of illustrations, taking the place of elaborate pictorial studies which adorned the pages of copyists' manuscripts before the time of Gutenberg. Woodcuts and wooden type were unable to stand up for long press runs, so metal was substituted. The first illustrations were probably engravings, produced by cutting lines into the metal plates by means of a sharp tool. The process was a tedious one. Mistakes, easily made, could not be easily corrected, and artists looked about for a process which would give them the results without the attendant difficulties.

Etching was the answer. The word "etch" comes from a Middle High German root which signifies "to eat." The process consists literally of an eating away of the metal. Acid does the work of the engraver's tool. The plate is covered with an acid-resisting wax or varnish, called a ground. The lines of the drawing are traced on the ground, then the ground along the lines is removed with a fine needle. The needle does not cut into the metal surface but merely exposes the plate, which is then immersed in an acid solution. The mordant*, as the solution is called, does not affect the ground, but eats into the metal where the ground has been removed. After sufficient time has elapsed, the plate is taken from the solution, the ground is stripped, and the plate is ready for printing. The plate is covered with printing ink, which is deposited into the recesses made by the mordant. The surface is wiped clean. As the plate passes through the printing press, the ink in the lines is transferred to the paper. A print is the result.

The etching process, developed at first to be of help only to the artist, found its way into commercial fields, for it is capable of giving a great variety of effects. Etched finishes are mainly decorative, although the reading matter produced by them remains legible for years. Should a plate become soiled or caked with dirt, a simple wiping will restore enough of the surface so that it can be read.

The principle of commercial etching is the same as that employed by the artist, though the commercial plate is not used for making prints. The design which the plate is to take is first drawn by the artist, usually larger than the eventually desired size. Then the design is photographed, and anywhere from thirty to fifty copies are made. These are mounted on a cardboard and again photographed. This photograph is reduced, so that each of the designs is of the size finally desired. No prints are made; only the negative is used in the process of making the finished etching plate. The photographic reduction from the larger size of the drawing to the smaller assures clear-cut, fine outlines.

The negative of this photograph is made on a sensitized wet plate of glass and is developed in the dark room just as common snapshot film is developed. The printing plate of metal is first sensitized, for its surface must react to the design which is to be imposed on it. The negative is placed over the sensitized metal and both held together by a frame. The negative is exposed to strong light. This makes a positive print on the metal printing plate, and this printing plate is then used to transfer the design to the actual metal to be etched.

Much aluminum has been used in the manufacture of nameplates. It is a metal that is easily handled, its color is light and easily visible, it is highly resistant to corrosion, it is durable and inexpensive, and it brings finishes to name plates which cannot be used on any other metal.

Etching on aluminum. Since so many nameplates are made of aluminum, it may be well to continue the discussion of the etching process as it applies to this metal. The principle is practically identical with that used for other metals.

The areas which are not to be etched are covered with an acid-resisting ground, able to withstand the

*An interesting etymological comparison may be used by studying **mordant** and **etching**. **Mordant** is derived from the Latin **mordere**, to bite.

action of the solution. The design is then printed on the surface of the plate with etching ink, after which the moist surface is dusted with 200-mesh asphaltum powder, the surplus removed, and the powder which may adhere to the uninked areas taken off with talcum powder. The asphaltum powder is then fused by heating the metal surface to about 400 deg. Fahrenheit to form an impervious protective coating over the metal which is not to be attacked.

The protected material is then cleaned and rinsed. After that, it is subjected to the action of an etching solution, which eats into the metal at the unprotected parts, while that part of the plate which is protected gradually forms the design. Various etching solutions may be used, but the one which has found greatest favor for action on aluminum consists of iron chloride and hydrochloric acid. There are others, such as hydrochloric acid by itself—a rapid solvent for aluminum which may be used effectively in certain cases.

If smoothness and rapid etching are desired, hydrochloric acid is saturated with sodium chloride, and the action may be further accelerated by adding small amounts of cobalt or nickel chloride to the acid solution. Sometimes the work is dipped in stannous chloride in order to deposit tin on the aluminum surface. By this procedure fine lines can be etched to a substantial depth without loss of definition. It is hardly necessary to say that in all of these operations the time, the temperature, and the acid concentration must be carefully controlled.

After the acid has done its work, the plate is removed from the solution, the ground is stripped, and the piece is ready for further operations. These may consist in simple polishing, highlighting the raised portions and thus making for easier reading, or more complicated treatments.

The coloring of nameplates. While simple etching without the addition of color may be suitable in some instances, by far the greater number of nameplates, direction tabs, and similar products are colored. Black is commonly used, and it is generally applied to the background. While this may seem to defy the laws of legibility, it must be remembered that the problem is different from that which is encountered by the printer of books. Reading matter usually consists of dark printing on a light background. The nameplate differs from other types of reading matter in that it is essentially a display piece, with color its predominant feature. It is neatly executed, it is bright, it draws attention. The number of words on most nameplates is not great enough to cause eye strain when read, no matter what the color combination. So the background of the plate is usually colored, while the lettering, the trade mark, the logotype, or a similar design is in the natural finish of aluminum.

The black used in coloring nameplates is generally black nickel, and it is applied by immersing the metal in a solution containing nickel and other salts, the color being deposited on the plate by electrolysis. During the operation, the raised portions of the plate are still protected by the etching ground, which is removed after the black nickel has been deposited. The color is commonly protected by a coat of colorless clear lacquer, which helps to increase the lustre of the black.

There are three methods of applying colored paint. It may be sprayed on through a stencil, or the entire piece of metal may be dipped, followed by a wiping of the highlights, or the piece can be colored by leaving the ground on after etching and while the piece is sprayed or dipped. The ground is stripped after the color has dried.

The coloring of embossed nameplates is accomplished by several methods. The raised surfaces may be protected by a ground and the whole piece dipped, the ground being subsequently removed, or the raised surface may not be protected. In the latter case, the raised surfaces are later wiped or ground off.

Finishing and Coloring by the Alumilite Process

A finish which does not employ any of the processes discussed, yet one which can be used both in its own right and as an accessory to the others, is the one which is applied to aluminum by the Alumilite process. It is one of the anodic oxide coatings which have been so successfully used to harden the surface of aluminum.

The Alumilite process is the most practical of the anodic coating treatments, for it can furnish plain, dyed, or mineral-pigment-colored surfaces. The hard, corundum-like coating, applied under suitable conditions, is extremely resistant to abrasion, and is actually among the hardest known finishes. It is of particular value in the protection of architectural aluminum, statuary, automotive pistons, cafeteria trays, and other commodities which are subjected to hard use.

Fig. 3. Varied Surface Treatment on Aluminum. Some of the plates shown are finished in two colors which may be applied by etching and painting, by etching and finishing with the Alumilite process, or by application of the Alumilite process by itself

Applied to nameplates, this finish is of particular value not so much because it is so hard, but because it can be colored. Various tints may be placed on the same article if desired. When finished, the pieces have a brightness and a lustre which make them most attractive.

A finish which has not yet been tried for nameplates, but which would give them a mirror-like sheen, is that which is applied to Alzak reflectors. These reflectors are used for floodlights, highway lights, and miners' lamps, and the reflection efficiencies are as high as 85 per cent. The coating is colorless, hard, and glassy, and, where brilliance is desired, would make a most scintillating finish for nameplates.

Even without the mention of this possibility it may be seen that a number of most interesting combinations have been developed with one metal alone. These, added to the combinations obtainable in other metals, give the user a large list from which to choose an effective nameplate.

Nickel in Brass Foundry Practice

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Nickel in Brasses and Bronzes; Nickel Silvers; Foundry Practice; Molding Sands.*

IN my travels, I find a somewhat different picture in the non-ferrous casting field than I did a year ago. I find a much healthier condition, as the foundrymen are busy, especially those around the Middle West, and building expansion is taking place in some instances. I also find that the personnel in most shops has been increased. Personally, I think this will continue, provided nothing happens at the end of this so-called "breathing spell."

The future is bright for the non-ferrous industry in general. The increased business of the foundry supply dealers will bear out this statement and this also goes for the manufacture of secondary ingot. I find that some foundries are reluctant about purchasing scrap materials of unknown origin and composition and do not care to take chances with rejections.

New Bearing Materials

Most foundries are continuing along the same lines as previously, but circumstances are forcing them to change to new methods to keep abreast of new developments, and these are coming along fast. Let us cite a few instances. For example, bearings used in automobile and large Diesel engines, demand new materials to withstand excessive strains. We of the automobile city have, up to within the depression period, relied on the tin base, bronze backed bearings for this application. It has done a very good job, and is still used very extensively. Later on, economy was the prime requisite with automobile manufacturers, and the thin steel babbitt-lined bearing was adopted. This saved the automobile manufacturers considerable money, but the danger was always present that the babbitt would flow out due to overheating and thereby damage the shaft by scoring. The higher speeds and higher duty demanded of automobile engines enticed the bearing manufacturers to develop new alloys, and this resulted in the adoption of the cadmium-nickel and cadmium-silver alloys. These were better in that the melting or flow point was somewhat higher, and this characteristic decreased the danger of the shaft scoring.

At the present time, due to the shortage and high price of cadmium, bearing experts are puzzled about what to do next. We know that considerable research work is going on with such materials as magnesium and even iron.

Nickel in Brass and Bronze

Another development which is rapidly finding wide popularity in the past few years is nickel in bronze. Nickel in brass and bronze is not new, but it has only been within the past few years that positive figures have been available whereby those concerned are furnished with data which will help them along in the casting of nickel bronzes.

The addition of nickel or its substitution for some tin in bronzes is a rather simple matter. If added to the composition, a proper amount is stirred into a bath of alloy regardless of what type of furnace is used. Some foundrymen use nickel as part of the charge. In all cases it is necessary to stir the metal quite vigorously in its initial entry into the alloy before pouring the molds. Also when using nickel, it is not necessary to change any of the current foundry practices, except for a slight increase in pouring temperatures; (in some instances they have been lowered due to increased fluidity).

Let us consider the substitution of some nickel for a like amount of tin in the Type "G" Bronzes, namely, the 88-10-2 and the 88-8-4 compositions. In both these compositions, up to 5% of nickel may be substituted for tin with an improvement in strength and ductility, especially the latter. Fluidity studies suggest that the pouring temperatures be increased about 20° F. for the 88-8-4 alloy and about 40° F. for the 88-10-2 alloy, for each per cent of nickel replacing tin. For every per cent of nickel substituted for tin in these bronzes there is a saving of approximately 16c. for every hundred pounds of castings shipped.

Where bearing properties are of prime importance, the nickel for tin substitution cannot be unreservedly recommended. In such instances it would be advisable to recommend a few experimental castings to test the suitability of the alloy for the bearing application involved, since a change in amount and structure of the delta eutectoid may adversely affect the bearing properties. For engineering applications in which bearing properties need not be considered, nickel for tin replacements can be safely and advantageously made. The replacement of more than 2½% nickel for a like amount of tin may require somewhat more adequate means of feeding the castings, and this should be considered when making such changes.

As far as physical properties are concerned, the 88-10-2 bronzes offer excellent possibilities with respect to nickel substitutions for tin. Such substitutions, up to 5% nickel, are accompanied by moderate increases in tensile strength and in ductility. For instance, where 5% substitution is made in the regular "G" Bronze, the yield point increases from 16,800 lbs. psi to 19,200 lbs. psi; the tensile strength increases

*From a talk before the St. Louis Chapter, A. F. A., May 14, 1936.

from 41,000 psi to 45,900 psi, the elongation in 2" from 26% to 34% and the Brinell hardness from 74 to 86. Another point worthy of note is the fact that even with 5% nickel no difficulty is experienced in getting satisfactorily sound tensile castings with no deoxidation other than 0.04% phosphorous. Some of the possibilities with respect to nickel for tin substitution in the 88-10-2 alloy have been discussed before, in which it is shown that the 5% nickel alloy can be further improved by a suitable heat treatment to yield a tensile strength of 84,000 lbs. psi, a yield strength of 66,000 lbs. psi, a proportional limit of 47,000 lbs. psi, an elongation of 2" of 28% and a Brinell hardness between 136 and 171. This is another development that has come to the front during the last 24 hours.

The electrical industry is adopting age-hardening compositions for innumerable parts where greater strengths are desired, such as heavy duty circuit breakers, etc. Tests have proven that even electrical conductivity has been improved. I have cited only one composition where this substitution can be made, but it is also true in the case of innumerable alloys: for instance, the 85-5-5-5, the 83-7-7-3, the 85-5-9-1, the 80-10-10 and other tin-containing bronzes.

The use of nickel in bronze is being adopted in a great many foundries, and ingot manufacturers have fallen in line and furnished industry with nickel-containing ingot.

Nickel Silvers

Another development, although comparatively new, is gradually taking a hold in the architectural field, namely, the colored nickel silvers, but, before venturing on this topic, let us go back temporarily to the simpler nickel silvers. The term "nickel silvers" covers a very wide range of compositions, and those alloys contain nickel from 10% up to about 30%; from then on they are classed as "cupro-nickels."

The main trouble I find with the casters of nickel silver is that they consider that it can be handled in the same manner as the regular bronzes.

The value of nickel in nickel silver is principally to the following effects:

1. The addition of nickel imparts a very beautiful silvery white color to all brasses and makes them suitable for many purposes where something ornamental is required. This change in color from the less ornamental yellow of the brasses is, of course, a gradual one and something over 15 per cent of nickel is required to give the best appearance.

2. What is equally important, or even more so, is the fact that the addition of nickel to brasses increases their resistance to tarnish and corrosion. Two examples will suffice to show the increased corrosion resistance which may be obtained by the use of nickel.

(a). Samples of 80/20 brass and of rolled 18% nickel silver were immersed in acid mine water for a period of about 120 days and the nickel silver was found to have corroded at a rate corresponding to only 2/3rds that of the brass.

(b). In lactic acid at 100° C. nickel silver was dissolved at a rate which was only one-half that of brass under the same conditions.

Impurities in Nickel Silvers

A discussion of the properties of the nickel silvers would not be complete without some consideration of the effects of impurities.

Oxygen, sulphur, silicon, phosphorus, antimony, and arsenic are all definitely objectionable in nickel silvers and the content of each of these elements should be reduced to a minimum.

Phosphorus and silicon are both powerful hardening agents, and while comparatively small amounts may do no particular harm, they should not be present in appreciable quantities.

Lead is a metal which may have a good or a bad influence according to what is required. It is well known, of course, that the presence of lead (which does not dissolve) improves the machining qualities, so that when these are of paramount importance that metal is often intentionally added. Some believe also that lead helps to produce sound castings, but we have not seen any actual evidence of this. There is no doubt that the presence of globules of lead-rich constituents has an embrittling effect which makes alloys containing it unsuitable for the severe working encountered, for instance, in deep pressing.

Manganese and magnesium are the two metals whose addition is regarded as definitely beneficial. While it is possible that manganese has the inherent effect of increasing the tensile strength, there is no doubt that both of these metals are mainly employed on account of their action as deoxidizers and desulphurizers. They therefore assist greatly in relieving porosity, unsoundness and brittleness, and their addition usually leads indirectly to an all-around improvement in properties.

Foundry Practice

We come now to the question of foundry practice in regard to nickel silver alloys, a subject which is only next in importance to that of composition. The melting of nickel silver is still largely carried out in crucibles in coke-fired furnaces, although more modern methods, such as oil fired, electric, and induction furnaces are coming into use. The last method has the merits of rapidity and freedom from contamination, though economic considerations may at present prohibit its use. The main points to be borne in mind when using coke-fired furnaces are:

1. That many injurious products of combustion are given off from the fuel.

2. These products will find their way into the alloys if they are not efficiently protected and if melting is not sufficiently rapid.

A good deal of porosity and similar troubles can be traced to too slow melting and unsatisfactory protection. Rapid melting is especially desirable and a forced draft will usually be found necessary. Writers differ as to whether graphite or clay crucibles should be used. Personally, I am inclined to the belief that the important question is their permeability to furnace gases.

The following are some of the most important items to remember when casting any of the nickel silver compositions:

Covering:

Glass has proved to be the best covering for this group of alloys. Charcoal is not permanent and will soon be reduced to ashes if not replenished often.

Silicon:

In the presence of lead, silicon in excess of 0.10% has a harmful effect tending to produce leakers or embrittlement. Scrap materials must be watched carefully as it does not take much silicon to change grain structure, thereby causing porosity and eventually rejects.

Deoxidizers:

There are many deoxidizers available which may be recommended but when in doubt, metallic stick magnesium of ⅝" diameter added in the amount of ¾ ounce to each 100 pounds of alloy is used very successfully. The magnesium should be plunged to the bottom of the bath approximately 5 minutes before pulling pot from the furnace. A convenient means of making the magnesium addition is to roll the end of a flat iron strip in such a manner as to be able to place the necessary section of magnesium rod tightly in the loop.

Pouring Temperature:

Pouring temperatures are equally important. A good range for nickel silvers is between 2250-2500° F., according to the size of the casting.

Rate of Pouring:

Rate of pouring also deserves consideration. Molds must be filled up quickly and runners and gates should be large enough to allow easy flow of metal to all impressions without squirting effect. It is also desirable to keep sprue filled up while pouring.

Mold Venting:

The higher the pouring temperature the more gas and steam generated in the mold cavity. Therefore, it is necessary to use a more permeable and somewhat more refractory sand to allow these gases to escape.

Colored Nickel Silvers for Architectural Applications

Recently, new interest has been shown in the architectural applications of nickel-silver, including plumbing fixtures of the highest grade, because of the ranges of color that can be secured by composition variables. For instance, we are now able to cast nickel silvers in delicate shades of blue, yellow and pink besides the white. Just three elements are used and these are copper, nickel and zinc. These are only mildly modified by the tin and lead which may be added to gain some advantage in casting facilities.

Manufacturers of refrigerators, drinking fountains, show cases, etc., where corrosion resistance is a problem and where attractiveness is a prime requisite, are showing much enthusiasm for these colored nickel silvers.

Iron in Nickel Silvers

There was a time when the foundrymen and metallurgists considered iron as being detrimental to the properties of the nickel silvers. However, it has recently been proven that the addition of iron, even up to 6% will bring out certain characteristics that are very useful in the food handling industry. Considerable discussion arose on this subject, and it has been proved that iron not only hardens the alloy but will prevent a scum or fog from accumulating on machines which are used for the handling of food products. It has also been shown that when iron is added to nickel silvers it has a tendency to decrease tarnish resistance. Iron is added to a bath of nickel silver either in the form of clean tin cans or in Armco squares (Armco sheet iron cut up into small sections and stirred into the bath of metal).

Altogether the term "nickel silver" covers a very wide range of compositions. Each composition is a problem by itself, but troubles can be eliminated with just a little thought and understanding of the fundamental principles of foundry practice.

Molding Sands

Speaking of foundry practice, let us delve into the molding sand situation as it is today. We find in the modern foundry that molding sand is purchased according to specifications; that is, it is purchased according to grain size, amount of clay content, permeability figure and amount of moisture. This is one of the things that have helped the foundrymen to solve many problems; it is the most important tool in the foundry, and the one that is most often neglected. Fundamentally, molding sand is comprised of sand grits, or grains, clay and water, and all three must be controlled.

It is very discouraging to hear complaints from foundries casting Monel metal in sand having characteristics similar to that which they use for aluminum match plate work or small brass parts. They do not realize that as pouring temperatures increase the molding sand must be different. As temperatures increase you must have a more permeable (or more open) sand; also, it must be more highly refractory. Some foundrymen do not realize that as pouring temperatures increase more steam and gases are generated in the mold that must escape through the sand; if not, a gassy or porous casting will be the result. Water is not a bond. I consider water as merely an agent to assist the clay to do its part in making up a good molding sand.

Natural molding sands, high in "silt" will also cause serious trouble. Silt is in the form of fines made up from vegetable matter, etc. Some sand suppliers today are furnishing foundrymen with the fusion point of their stocked sand in their specifications. This is another great step forward. Fusion temperature is arrived at by the use of a sintering tester.

A sand with a high sintering point will produce castings which are easily cleaned and of superior finish. So-called fines, or silt, in a molding sand are not easily removed although some shops have set up a suction system for this purpose. As this sand is in the process of being aerated, this suction will have a tendency to draw off these fine particles and leave a more open and refractory material in the heaps.

These foundries casting alloys of a higher nickel content, namely, the cupro-nickels, Monel metal and modified Monels, will find it very convenient if they forget brass foundry practice and go into the steel founding operations. Metals whose pouring temperatures are well up into the 2700° F. range need a little closer supervision, but, after everything is said and done, just the application of a little thought and "horse sense" will prove beneficial to those using nickel.

The Effect of Iron Impurities on the Annealing of High Brass

The Effect of Iron Impurities for Temperatures from 600° to 1200°F. and for Iron Impurities from 0.008 to 0.287 per cent. The Effect of Time on the Annealing of Brass.*

By W. A. GIBSON and J. H. DOSS

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Introduction

IN THE brass-rolling mills it has long been known that varying amounts of iron in high or cartridge brass sheet cause erratic annealing. As a result an upper limit of 0.05 per cent iron is customarily set for quality brass such as that used for cartridge cases. For other uses the maximum limit is variously set from 0.05 to 0.10 per cent. The great increase in the use of polished and chromium-plated parts, especially on automobiles, in the last 5 years has made necessary a very close control of grain sizes and tempers. Grain-size limits of ± 0.005 mm. are now the rule in much sheet brass shipped in strips. The effect of increased iron is to retard grain growth. Therefore, variations of iron impurity make close control of grain size difficult. Little, if any, quantitative data have been published on the subject.

Cook and Miller[1] published the results of an investigation on cartridge brass. Although the material used differed from that of the present investigation the results are sufficiently similar to make a short review of their data worth while. Figure 1 is a reproduction of one of the figures of their paper. This shows that the temperature of initial recrystallization is only slightly affected, if at all, by iron impurities from 0 to 0.49 per cent; that the resulting temper becomes harder as iron increases; and that there is a secondary recrystallization which begins at 500 to 600C. (930 to 1110 F.), depending upon the iron content, and is practically completed for all iron contents at 700 C. (1290 F.)

Their work has not covered sufficient samples near and below 0.10 per cent iron to determine quantitative effects of the amounts commonly present in brass. It is this field the authors seek to cover.

Procedures

Samples were obtained having the following analysis:

SAMPLE	COPPER, PER CENT	LEAD, PER CENT	IRON, PER CENT
No. 1	66.4	0.030	0.008
No. 2	65.9	0.010	0.018
No. 3	66.4	0.080	0.040
No. 4	66.7	0.030	0.049
No. 5	66.5	0.080	0.066
No. 6	66.2	0.12	0.085
No. 7	65.8	0.01	0.118
No. 8	64.7	0.01	0.140
No. 9	64.5	0.01	0.204
No. 10	64.1	0.01	0.287

These were cast into bars 6 by 2 by 65 in. and were cold rolled to 0.065 in. thick by reduction of approximately 50 per cent between anneals at 1200 F. At 0.065 in. the metal was annealed at 1050 F. for 2½ hr. and was then cold rolled to 0.040 in. thick. All the tests were carried upon metal at this gage.

Standard A.S.T.M. tension test specimens and small squares were cut from these strips. These were then placed in an electric muffle furnace (4 by 3½ by 10 in.) automatically controlled to ±5 deg. Fahr. by a recording potentiometer. The furnace was already at the required temperature and the control thermocouple was so placed that it rested on the surface of the test specimen.

After the furnace had regained the drop in temperature, due to opening of the doors and inserting the cold charge, samples were removed at intervals of ¼, ½, 1, 2, 4, and 8 hr. This was carried out at 600, 700, 800, 900, 1000, 1100, and 1200 F., and the resulting data plotted.

The data obtained consisted of Rockwell and scleroscope hardnesses, yield point, tensile strength, elongation, Erichsen value, and grain size.

GIBSON AND DOSS

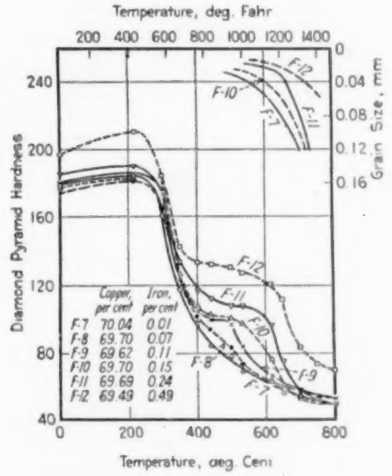


Fig. 1. Hardness Data of Cook and Miller's Paper

Rockwell hardness was measured on small specimens 1 in. square. These were pickled, washed and dried in sawdust. A 100-kg. load with 1/16-in. ball ("B" scale) was used. The equipment was calibrated using standard test blocks purchased from the instrument manufacturer.

Scleroscope hardness was measured on the same specimen using a magnifier hammer which, on brass, gives a reading 1.75 times the standard universal hammer.

* From a Paper read at the Meeting of the American Society for Testing Materials in Atlantic City, June 29-July 3.

[1] Maurice Cook and H. J. Miller, "The Effect of Different Elements on the Annealing and Grain Growth Characteristics of Alpha Brass," **Journal, Inst. Metals**, Vol. xlix, No. 2, p. 250 (1932).

Yield points were taken with dividers at stress corresponding to 1 per cent elongation.

Tensile strengths were obtained using a 50,000 lb. beam-type testing machine and specimens prepared for a 2-in. gage line in accordance with A.S.T.M. Standard Methods of Tension Testing of Metallic Materials (E 8-33).[2]

Erichsen values were obtained using the standard equipment which has a semi-spherical punch of 10-mm. radius with a 27-mm. inside diameter hold-down ring. All samples were prepared for test in the same manner as the Rockwell specimens. Both punch and metal were entirely free of oil or any other lubricating material during the test.

Grain sizes were estimated to the closest 0.005 mm. by comparison with the chart which forms part of the A.S.T.M. Standard Rules Governing the Preparation of Micrographs of Metals and Alloys (E 2-30).[3] Observer's errors in comparison were occasionally checked by actual grain counts.

The iron analyses were made by the iron-oxide method. Three independent sets of analyses were made and were not accepted until all three sets checked.

Data

The resulting data were plotted on seventy charts. each temperature with each iron content being plotted as one chart. Only one illustrative figure is given here which shows the plotted data for 0.049 per cent iron annealed at 900 F. for the times shown (Fig. 2).

From these plots the values obtained after two

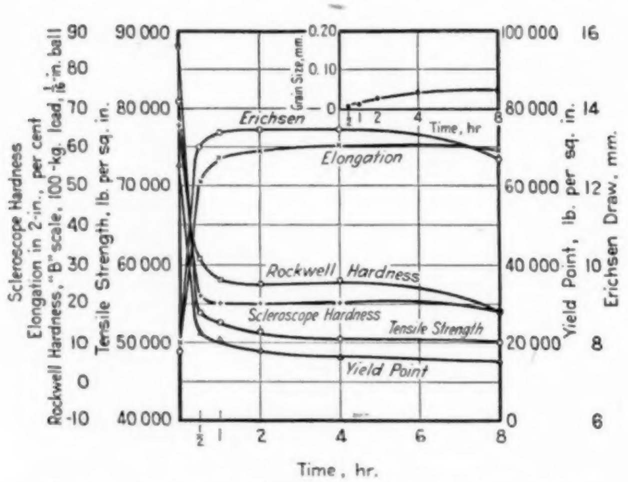


Fig. 2. Data for 0.049% Iron Annealed at 900° F.

hours annealing have been taken. Rockwell values for various temperatures are as shown in Fig. 3, and the corresponding grain sizes in Fig. 4. The other

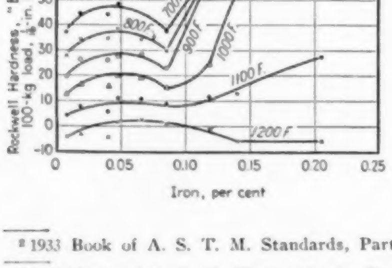


Fig. 3. Effect of Iron on Rockwell Hardness of High Brass

physical values were obtained but those shown give sufficiently closely the effect of iron impurities.

For those interested in tensile strengths we find that in this work the following approximate relationship holds for samples annealed between 700 and 1200 F. It does not hold for hard or for imperfectly recrystallized metal:

$$T = 3100\ B + 43{,}000$$

where T = the tensile strength in pounds per square inch, and

B = the Rockwell hardness using a 100-kg. load with a 1/16-in. ball.

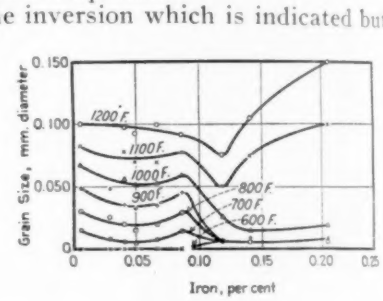
Discussion of Results

The figures given are self explanatory. We find that at about 0.09 per cent iron there is a very sudden change in annealing properties. This change is so sudden that great non-uniformity of product will result if brasses containing more than this are processed with those containing less.

On the other hand, high iron contents are not harmful and may even be beneficial in certain cases as for example in quarter-hard material where a fine grain on the finish material is required.

Figure 4 shows the inversion which is indicated but

Fig. 4. Effect of Iron on Grain Size of High Brass



is not definite in the hardness data of Cook and Miller's paper (see Fig. 1). For the higher annealing temperatures iron contents over 0.09 per cent may actually assist in recrystallization.

We suggest, as a possible explanation for the sudden discontinuity in effect of iron, the formation of a copper-iron-zinc compound at the grain boundaries during the initial recrystallization; that this enveloping boundary presents further amalgamation of grains until it reaches a high temperature at which it is taken into solution and annealing again occurs. Such an explanation would account for the secondary recrystallization as reported by Cook and Miller, as well as the divergence, at high iron content of the curves shown in Fig. 4.

That the retarding influence is not present at the start of annealing is shown by the negligible effect which iron has on both the initial recrystallization temperature and the time required for this initial recrystallization. At the lower temperature iron content in excess of 0.09 per cent very slightly reduces both the temperature and time required for the initial recrystallization.

The iron percentage at which the sudden discontinuity occurs can also be shifted by traces of other impurities, but a discussion of these other impurities is outside the scope of this paper.

Conclusions

1. In high brass having lead and iron as the only impurities, iron contents as high as 0.09 per cent are not harmful to annealing.

2. In such material a great discontinuity in anneal-

[2] 1933 Book of A. S. T. M. Standards, Part I, p. 949.

[3] 1933 Book of A. S. T. M. Standards, Part I, p. 900.

ing properties occurs between 0.09 per cent and 0.118 per cent iron.

3. The presence of iron greater than 0.118 per cent is not harmful to sheet high brass provided proper allowance is made in processing and use for its annealing properties. If these allowances are not made it is very harmful.

4. A need exists for information on the annealing properties of high brass containing less than 0.005 per cent iron.

Acknowledgments

We desire to express our thanks to Messrs. Cook and Miller for permission to use a part of their data; to our colleagues Messrs. Stedman, Oestrike, and Hawkins who have carried out most of the tests required; and particularly to the management of the Revere Copper and Brass Inc. for permission to publish data which have been accumulated in their Michigan Division as a part of plant control.

Notes on Low Melting Point Alloys

THE extent to which low melting point alloys are used in commercial developments is a matter of considerable surprise to many metallurgists and engineers. Even those who are familiar with the use of these alloys and their various modifications and manifestations are often unacquainted with the constituents involved in their composition and the effects of variation of each upon their physical properties, such as melting point, expansion, non-shrinkage, etc.

As is fairly well known, most fusible alloys and low melting solders consist of bismuth, tin and lead. Bismuth possesses the very unusual property of expanding on cooling. It is, therefore, used not only to make the alloy or solder more easily worked by lowering its melting point, but if it is present in sufficient quantities its expansive tendency counter-balances the effects of contraction of the other metals, and the net result is the prevention or reduction of shrinkage in the mold.

Some peculiar and even surprising results can be obtained by alloying varying proportions of bismuth, lead, tin and cadmium together. Thus, although the melting point of lead is 621° F., cadmium 610° F., bismuth 520° F., and tin 450° F., yet modification of the composition of these non-ferrous metals gives an almost endless series of alloys with melting points between 150° and 600° F. The quaternary "eutectic" mixture of bismuth, lead, tin and cadmium is the most fusible of all alloys of common metals except those containing mercury. Addition of sufficient mercury to the bismuth-lead-tin-cadmium alloys lowers the melting point to room temperature.

When making low melting point alloys, the lead should be melted first and when completely molten, rosin flux added. The metal is then thoroughly stirred and any dross formed during the stirring is removed before adding the tin, bismuth and cadmium. The metals should be stirred for several minutes after each addition is made (in the above mentioned order) and carefully regulating the temperature to prevent overheating.

In adding mercury to soft alloys a hardwood stirring rod instead of a metal rod should be used, the stirring end of the rod being charred on the surface before placing it into the molten alloy. It is inadvisable to breathe the fumes from metals holding mercury as they are dangerously poisonous. Experience teaches that there is little if any real economy in making low melting point alloys used in modern industry which must be made from virgin metals when they can be purchased from reliable sources.

The composition and melting points of some useful metal alloys which have very low melting points are given in the accompanying table:

NAME	MELTING POINT DEGREES FAHR.	COMPOSITION PER CENT BISMUTH	LEAD	TIN	CADMIUM	ANTIMONY
Wood's alloy	149	50.0	25.0	12.5	12.5	....
Lipowitz's alloy	154	50.0	27.0	12.5	10.5	....
Cerrobend	160	50.0	26.7	13.3	10.0	....
Cerrosafe	180	40.0	40.0	11.5	8.5	....
D'Arcet's alloy	200	50.0	25.0	25.0	...	....
Newton's alloy	201	50.0	30.0	20.0	...	....
Cerro-matrix	248	48.0	28.5	14.5	...	9
Cerrobase	255	52.0	48.0	...	...	....
Tinsmith's solder	340	...	33.3	66.7	...	....
Plumber's solder	440	...	66.7	33.3	...	....

—A. Eyles.

Hard and Soft Spots in Brass Castings

Q.—Will you please give me some information on trouble I am having making brass castings?

We use a good grade of scrap brass. Our molds are nice and smooth. When we machine our castings we find hard and soft spots in them. Some castings are hard on the top and soft on the bottom, and some have clean holes in them. Some of the brass, when taken out of the sand shows up white. We use a coke furnace. How can we overcome this trouble?

A.—From what we can gather from your letter your trouble is in your metal. The fact that the castings show white is evidence that your scrap contains aluminum. This would explain the hard and soft spots, also the holes. You should select scrap brass that does not contain aluminum or silicon.

We suggest that you use ingot brass purchased from reliable smelters. It is difficult to sort scrap brass unless you are experienced in this line.

We believe you would save money by using ingot metal and overcome the difficulty you are now having.

—W. J. Reardon.

Alloys in the Zinc Bath

By G. A. BRAYTON
Superintendent, Galvanizing Division,
Newport Rolling Mill Co., Newport, Ky.

The Addition of Tin Alone Works Best in the Zinc Bath, Giving the Best Adherence, Uniformity and Appearance of the Coating.*

THE prime object of galvanizing is to apply a cheap protective coating on the article to prevent corrosion. The features of uniformity, appearance and adherence of the coating are of next importance. The composition of the zinc bath affects all of the above features and also the workability of the bath. Consequently in selecting the composition of the zinc bath these five features plus the additional and important thought of cost must be the determining factors.

The metals commonly used in changing this composition and producing the alloys desired are tin, antimony and aluminum. In addition there are always present alloys of lead and iron with zinc.

It is undoubtedly true that of all metals mentioned pure zinc affords the greatest protection from corrosion of iron and steel. However, if we were to purchase the purest zinc made it would, as soon as it melted, begin to alloy with the iron of the steel pot and to a much greater extent with the iron of the product coated. The chemical reaction of the zinc with the iron chloride carried on the product into the bath also produces zinc iron alloy (dross) and zinc chloride. The zinc dross is predominately $Zn_{17}Fe$. Part of the dross settles gradually to the bottom of the pot and part, in the case of sheet galvanizing, is carried out on the sheet, forming the inner layer of the coating.

The chart shows the analysis of the vertical section of a galvanizing pot which had been drossed on Saturday and sampled while in operation on the following Tuesday, Thursday and Saturday. It shows plainly the distribution of the dross in the pot and also the comparative freedom from dross in the last twelve inches of travel of the sheet in the bath.

In addition to the dross there is also some lead zinc alloy which varies in amount according to the grade of spelter purchased. It is usually between .50% and 1.00% of the zinc. The amount alloyed with the zinc depends upon the temperature of the bath. As the pot cools the unalloyed lead sinks to the bottom of the pot beneath the dross where it is more or less trapped until the bath is stirred up in drossing.

As both the lead and iron alloys are present on the article coated and as both afford less resistance to corrosion than zinc it follows that both are detrimental to the coating and must be considered impurities in the coating, impossible of elimination. Further, on account of the brittleness of the dross the coating is less adherent than it would be if it were all pure zinc.

The appearance of sheets coated without other zinc alloys than iron and lead is smeary and not uniform unless fluxed. It carries some small white arrow shaped spangles in a field of blue, is unattractive to the trade and discolors easily.

In the sheet galvanizing process the general custom has been to add tin in varying amounts to the above mixture of zinc and zinc iron and lead alloys to produce more white spangles and improve the appearance. Like iron and lead it is more easily corroded than zinc and in some specifications, (namely U. S. Government), it is considered an impurity and limited in amount. It alloys in any percentage with zinc, diffuses fairly quickly through the bath and, as it melts at 337° F. below zinc, makes the bath more liquid. In increasing amounts it increases workability of the bath, uniformity, and adherence of the coating. In these respects it improves the resistance to corrosion which in our opinion completely counteracts all objections on account of its corrodability when present in amounts of one to two per cent. It improves the attractiveness of appearance by increasing the white spangles. One and one-half per cent tin in the coating produces irregularly pointed spangles mostly white and feathery, and, all other things being equal, it increases the size of the spangles. Sheets of this sort tarnish slowly. Further, sheets recoated without stripping maintain their attractive appearance, which does not occur in sheets recoated with low percentages of tin.

Amounts greater than one and one-half per cent of tin have been tried successfully to improve the adherence of the coating to a marked extent. However, as every pound of tin is equivalent to ten pounds of zinc in cost, percentages such as eight per cent increase costs of galvanizing beyond the realm of practicability.

Antimony added to the bath alloys with the zinc in all proportions and diffuses through the bath about the same as tin if alloyed with zinc to reduce the melting point before putting into the pot. Like tin it reduces resistance to corrosion in the coating. It decreases the size of the spangles very materially but when used with tin it adds luster to the spangle and increases the amount of blue spangles especially when fluxed. It decreases adherence of the coating on the sheets and does not improve the workability of the bath.

Antimony, tin and cadmium used in dip pots produce very attractive, large and sharply delineated spangles.

Aluminum has no place in a sheet pot except, perhaps, over the week end to physic the metal. Alloyed with zinc first to lower the melting point and introduced into the zinc bath it diffuses through the pot with great rapidity and its power to bring the dirt up through the pot metal makes black dirt spots ap-

*Address presented at 18th Annual Meeting, American Zinc Institute, Inc., St. Louis, Missouri, April 21, 1936.

pear on the sheets. In dip pots where the product has small relative surface and pieces are turned over it produces beautiful product with few white spangles on bright blue metal which holds its luster for a long time. This coating is adherent and fairly uniform.

The alloys mentioned are those at prices that come within the relationship of selling prices of the product. Experiments with copper, nickel and chromium alloys with zinc have been made with indifferent and unconclusive results. Cadmium, as mentioned above, perhaps has a place in the zinc bath, but only as a specialty to produce a desired appearance.

It would be quite contrary to our experience to infer in this short talk that appearance and size of spangle can be controlled completely by varying the alloys in the zinc bath. We believe, beyond any doubt, that we have proved that the base metal and its treatment in rolling, annealing and pickling play the major part in these respects.

In conclusion, however, we wish to bring out, first, that the lead and iron alloys with zinc, present at all times, are both detrimental and the latter is very expensive to the galvanizing process with no known method of eliminating it. Nor have we found that the addition of any other metal or alloy materially reduces the dross production; second, the addition of tin alone works best in the zinc bath and produces the best results in adherence, uniformity and appearance of the coating. It also has the advantage of being easily controlled; third, aluminum is beneficial in dip pots only, and last, so little has been done with other metals, and some experiments have had such disastrous results, that without extensive research it behooves us to proceed with caution.

Slush Casting

Q.—I have re-read your response to Problem 5,515 on slush casting, on page 268, July issue many times and have profited therefrom. The latter part of the final paragraph leaves me confused. I might clarify my confusion by admitting that I am one of those employing the old fashioned method of pouring by hand and turning the hot heavy mold over to discharge the excess of "slush."

I really should like to employ an easier method, but the terms used in your description are not within my comprehension. What is the exact nature of the mechanism you mention? Is it a core?

Additional details of the "swing die bolster" or an illustration thereof would help greatly.

A.—With the new method of slush molding it is said that it is not necessary for the operator to touch the die, as they are mounted in a die bolster that eliminates a large amount of handling, refitting the mold, etc. The cores are moved in on a plate with parallel guides. Old molds can be fitted to the bolster.

For information on such machines consult the advertising pages of **Metal Industry.**

—**W. J. Reardon.**

Treatment of Galvanized Sheets

Q.—YOU published in your June issue, on pages 215-16, an article by J. L. Schueler, from his address at the meeting of the American Ink Institute in April, on the Treatment of Galvanized Sheets for Painting.

In column 2, page 215, paragraph 3, reference to a solution for washing the sheet, made up of one lb. of sal soda dissolved in three gallons of water.

Could you tell us:

1. The temperature at which this solution is operated.

2. The length of time the sheets should remain in this solution.

A.—(1) The sal soda solution is applied to the sheet by sponging at a temperature not lower than 75° F.

(2) The sheet need only be dipped in the solution.

(3) The sheet should be allowed to dry for 24 hours before applying the paint.

I am advised that if the solution is used as noted above, paint will adhere satisfactorily to the galvanized sheet surface.—**J. L. Schueler.**

Metal Content of Plating Salts

SALT	FORMULA	% METAL CONTENT
Cadmium Oxide	CdO	87.5
Chromium Trioxide	CrO_3	52.0
Cobalt Sulfate	$CoSO_4 \cdot 7H_2O$	21.0
Copper Cyanide	$CuCN$	71.0
Copper Carbonate (Basic)	$Cu(OH)_2 \cdot CuCO_3$	55.3
Copper Sulfate	$CuSO_4 \cdot 5H_2O$	25.5
Gold Chloride	$AuCl_3$	65.0
Chlorauric Acid	$HAuCl_4 : 4H_2O$	47.8
Gold Cyanide	$AuCN$	87.7
Iron Chloride	$FeCl_2 \cdot 4H_2O$	28.1
Ferrous Ammonium Sulfate	$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.2
Nickel Carbonate (Basic)	$2NiCO_3 \cdot 3Ni(OH)_2 \cdot 4H_2O$	49.9
Nickel Chloride	$NiCl_2 \cdot 6H_2O$	24.7
Nickel Salts—Single	$NiSO_4 \cdot 6H_2O$	22.3
Nickel Salts—Single	$NiSO_4 \cdot 7H_2O$	20.9
Nickel Salts—Double	$NiSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	14.9
Platinum Chloride	$PtCl_4$	57.8
Chlorplatinic Acid	H_2PtCl_6	37.7
Silver Chloride	$AgCl$	75.2
Silver Cyanide	$AgCN$	80.5
Silver Nitrate	$AgNO_3$	63.5
Tin Chloride	$SnCl_2$	52.5
Sodium Stannate	$Na_2SnO_3 \cdot 3H_2O$	44.4
Zinc Carbonate	$ZnCO_3$	52.2
Zinc Chloride	$ZnCl_2$	48.0
Zinc Cyanide	$Zn(CN)_2$	55.7
Zinc Oxide	ZnO	80.3
Zinc Sulfate	$ZnSO_4 \cdot 7H_2O$	22.8
Lead Carbonate (Basic)	$2PbCO_3 \cdot Pb(OH)_2$	79.2

The metal contents, as listed above, are for the pure compounds. The purity of the salt should be considered in using these figures. Also, due to the fact that some of the salts, like tin chloride and zinc chloride are hygroscopic and absorb water, while others like single nickel salts and copper sulfate lose part of their water of hydration on standing, the actual metal content of a commercial chemical may differ somewhat from the figure given in the above table.

—**Nathaniel Hall.**

A Suggested Method For Preparing Deliquescent Tin Dross Samples

By J. B. KASEY
Chemical Engineer.

The Work Must Be Done With Great Care in Order to Prevent Disagreements Between Sellers and Buyers of This Material.

TO prepare satisfactory and representative laboratory samples from large samples of 25-50 lbs. of tin dross, containing anhydrous, deliquescent mixed chlorides of stannic and stannous tin, is by no means an easy task in either time, expense or satisfaction with regard to accuracy when following customary procedure.

Due to the relative expensiveness of the metal tin accuracy in securing a representative sample from a lot of such dross, its proper preparation for the laboratory, and subsequent analysis are of prime importance.

The dross as usually received in a smelter contains metallics, dirt and other foreign substances, and chlorides of tin, and is sealed from atmospheric moisture sufficiently so that it does not cake. However, when this is not done, the dross is usually so wet from absorbed moisture that it is similar to a mud.

With a gross weight obtained upon arrival, a 25 to 50-lb. sample is carefully taken in duplicate, gross weights secured on both, and then one of these samples is dried overnight at 100° C. while the other is held in reserve. The next morning the dried sample is cooled somewhat and weighed while still quite warm, the difference between this weight and the weight before drying usually termed "moisture loss." Actually, there is a loss due to volatilized stannic chloride, for this salt is very volatile at the drying temperature employed and is always seen as a dense vapor rising from the sample. A lower temperature is therefore recommended for this step, or better, no drying at all. In the latter case the settlement can be made on the basis of "as received," thereby avoiding this source of loss of tin.

Another bad feature of drying is absorption of moisture during the time the sample is cooling and before it is weighed. This additive error being a compensating one minimizes in varying degree the loss of tin due to volatilization, but makes the moisture determination too low.

The method of preparing such a deliquescent tin dross is based on the formation of moisture-inert compounds by the addition and double decomposition of dry, powdered soda ash (58% Na_2CO_3) and the tin chlorides present in the tin dross. It is only by breaking up these deliquescent tin chlorides into insoluble forms that screening and pulverizing of the sample can be carried out and a uniform, fine product obtained for laboratory analysis.

As no drying is preferential in that no loss of tin ensues, the method of preparing the 25-50-lb. sample will proceed from this point. A net weight is first obtained on the sample to be prepared by subtracting the weight of the tared pan from the gross weight of pan and sample and recorded. In another pan enough dry soda ash is weighed so that it will provide a large excess (two to three times) over that required on the basis of estimated chlorine content. This soda weight may be recorded for later reference. Of this weight 2/3 are added and stirred thoroughly into the tin dross, breaking up the large aggregates.

Upon stirring the mixture for a few minutes a notable rise in temperature will be observed, and in cases where the chlorine content is very high, absorbed moisture will be evolved vigorously as steam. As soon as the mixture cools down and feels very dry, the sample is passed first through a 4-mesh screen to separate large metallics. The minus product is then pulverized fine enough to pass a 40-mesh screen, the separated fine metallics united with the coarse metallics to be melted down into a bar.

If hand mixing of the soda ash and tin dross is the method employed, a thorough decomposition of all of the tin salts is not possible so that in pulverizing the minus 4-mesh material it is necessary to alternate the feed to the pulverizer with some of the reserved soda ash. In this way, caking within the pulverizer is avoided. However, the best method of mixing the soda ash and tin dross is by tumbling for an hour or so in a porcelain mill of the Abbe type. This enables one to screen with ease through an 80-mesh screen instead of a 40, making possible better analytical checks in the laboratory.

After melting down the combined metallics, the bar is weighed and the residual small amount of dross added to the main portion. All of the screened dross is now weighed and the weight recorded with the explanation "after preparation." The dross is now quartered down in the regular manner to about a 2-lb. size sample for the laboratory.

To calculate the proportions of dross and bar sawings to be taken for analysis, simply divide the "after preparing" weight of dross by that of the sample before adding the soda ash, and also the bar weight by this latter weight. The combined percentage of the two will, of course, be greater than a hundred because of the addition of the soda ash. The results of the analysis will be reported on the basis "as received." With products carrying excessive moisture, moisture determinations may be made but only at a much lower temperature than 100° C.

From the foregoing, it is apparent that since the tin dross sample has not been subjected to any heat high enough to volatilize tin chloride there is no loss of tin during the period of preparation, which, in turn, along with created, favorable pulverizing and screening conditions, assures satisfaction in the settlement between buyer and seller.

"Trouble-Shooting" on Electro-Plating Generators

By L. L. STOFFEL

Chief Engineer, The Ohio Carbon Company, Lakewood, O.

The Cures for the Common Troubles which Occur in Routine Practice.

EVERY now and then a plating generator starts to "act up," after behaving itself properly for weeks or months. The following hints on locating the trouble are not intended to cover the more complicated internal troubles which may be present in the machine. That is a job for a skilled electrician, and any attempt to "fix" such defects is apt to result in "fixing" them so that the machine can't be used for days. But nine-tenths of ordinary running troubles are merely a matter of minor adjustments, and there seems little reason why the superintendent should not save delay by making them himself. Nearly all these minor troubles can be traced to dirt and neglect; for a plating generator often gets less attention than any other type of electrical machine—although, on account of the heavy currents and low voltages used, it needs it more.

Failure to Excite

This may be due to five main troubles—internal defects, "glazed" commutator, loss of residual magnetism, brush trouble of various kinds, and **DIRT.** In the last-named may be included ordinary plain dirt, grease, corrosion by water and plating solutions, and burning action due to bad contacts in the circuit somewhere.

Proper excitation depends on the fact that there is practically always a slight trace of magnetism left in the poles even when no field current flows around them. If the armature is revolving at its proper speed this feeble magnetism causes a very small current to be generated. This increases the magnetism in the poles and thus causes an increased voltage to be generated; which in turn again increases the field current, until a few seconds the machine is fully excited. The first thing to look for, therefore, is bad contacts in the brush or generator connections which are preventing the passage of the first feeble currents around the pole windings. Since the electrical pressure of these is seldom more than 2% to 6% of normal running voltage it is evident that it does not take much to stop them. See that all cable connections are tight, and that their contacting surfaces are clean and bright and are in contact all over. If this matter is OK, examine the commutator, brushes and brush-rigging. Perhaps the commutator is glazed over with a film of firmly adhering oxide which acts as a partial insulator. It may be corroded, or burnt by sparking. "Glazing" may be cured by the application of sandpaper to the surface while the machine is running. If merely dirty, clean it with carbon tetrachloride—the ordinary "non-flammable" dry cleaner fluid sold under many trade names. Gasoline may be used, but its inflammability renders it undesirable; moreover, if spilt on the rubber insulation of the connecting cables it is apt to soften and spoil it. If the commutator is too corroded or burnt to yield to this treatment it may be necessary to have the electrician take a fine cut off the running surface in a lathe, or to grind it smooth by using one of the many types of commutator-grinding attachments which bolt directly on the machine and thus avoid the need to remove the armatûre during the resurfacing operation. A grinder, moreover, is preferable to a lathe for the job because with the latter there is always the chance that the turning tool may "bite into" the commutator and thus burr over two adjacent bars—causing a short-circuit in the windings

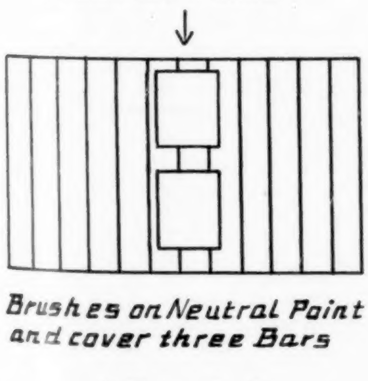


FIG. 1-A

Fig. 1. When brush studs are loose or skewed, the brushes are collecting current at different points. Furthermore, they are collecting it over too many bars at once. Fig. 1-A shows correct number of bars which should be covered in a certain case. Fig. 1-B shows the number covered when the brush stud is slightly skewed

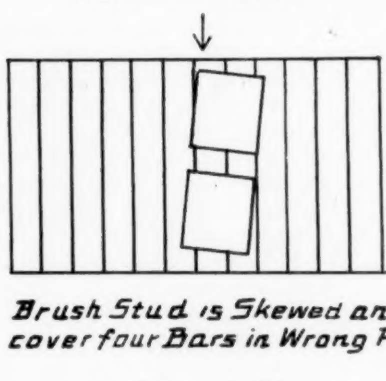


FIG. 1-B

which would soon overheat some of the armature coils. Always polish the surface after turning or grinding. Next examine the brushes and see that their running surfaces are making good contact with the commutator all over their area. If so, they will show a smooth polished surface clear to the edges, for the metal-graphite brushes used in all modern plating generators take on a high luster after running for a few days. If they do not make proper contact all over, they must be "bedded in" with sandpaper till they do. Note, moreover, that if the commutator has been re-turned or re-ground as described above, this "bedding in" should always be done; because it is evident that two circles of even slightly different diameters which touch each other can only

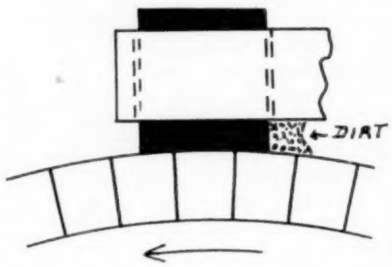


Fig. 2. Another cause of sparking and armature heating due to bridging too many commutator bars at once. The piled-up conducting dirt, grease and metal graphite dust mixture practically increases the effective width of the brush beyond normal

FIG. 2

do so at one point. Theoretically, therefore, the brushes can only pass current along a small fraction of their area. Practically, of course, it is seldom anywhere near as bad as that, but it is as well to play safe, especially if the commutator was in such bad shape that a decided reduction of diameter is produced by the re-surfacing.

Just a few hints as to the best way to bed in a brush. First remove the spring tension from all the brushes on one stud. Then slip a strip of sandpaper under them. Replace the brush spring tension as heavily as possible. Then pull the sandpaper strip under the brushes in the direction of the armature's rotation, and repeat this operation till the brushes show sandpaper marks clear to the edges. It is important that the sandpaper be held well down to the commutator surface so as to get the correct curvature. Finally, remove the sandpaper, blow all dust out of the machine, re-set the spring tension to its normal running condition, and start up the generator. Next gradually adjust the spring tension till the pressure is as light as possible without causing chattering or sparking of the brushes.

If the machine still fails to excite, see if the brush studs are out of line with the commutator bars, or if the brush rocker has been shifted from its proper position. In the former case, (which is generally caused by shrinkage or breakage of the stud bushings, or by the stud nuts working lose), the brushes of one set will be collecting at slightly different points of the commutator, and even if the machine starts up sparking and heating are likely to ensue. In the latter case, of course, ALL the brushes are in the wrong commutating positions. Examine brushes for loose pigtails, broken pigtails, or connections loose on the end lugs which are screwed or otherwise secured to the brush holder. These faults can often introduce a resistance into the circuit which may equal more than half the running voltage of the generator.

If the above measures all fail, maybe the residual magnetism is too weak, or entirely destroyed by such causes as a heavy blow on the generator frame, or excessive vibration. If the machine is furnished with small auxiliary poles, or "interpoles," as most modern plating generators are, try bridging two adjacent brush studs of opposite polarity with a piece of ten ampere fuse wire. If there isn't any handy, it is useful to remember that one strand of the very fine wires which make up the ordinary flexible lamp cord will do equally well. This bridging will permit current to flow through the interpole windings and will generally cause the generator voltage to build up to normal. The strand of wire will then of course melt and break the short-circuit. If the machine has no interpoles, and is "shunt-wound," it is impossible for it to excite if the armature is thus short-circuited before starting up; but for no very apparent reason it is often possible to get it to excite by repeatedly "flashing" or making and breaking the short-circuiting action of the wire strand or fuse wire while the armature is turning.

But in a very few instances there may be no residual magnetism at all. Then disconnect the main cables feeding the tank circuits, (or open the main switch if there is one), and slip a piece of cardboard of thick paper under each brush so as to raise it off the commutator. These measures leave only the field coils connected to the brush studs. Now apply the ends of a pair of wires attached to an ordinary automobile battery to two adjacent studs of opposite polarity for a few seconds; remove them from the studs; remove the cardboard from under the brushes; and re-start the generator. It will now generally "pick up" and generate at normal voltage. However, if it does not, the magnetism may be now in the wrong direction. Do as before, but with the leads to the battery reversed. If all these methods fail, some internal trouble demanding the services of a skilled electrician suggests itself. To aid in quick diagnosis of "failure to excite" trouble, it may be mentioned that if decided sparking was present during the last run before the failure, brush trouble had better be sought for first.

Next, re-connect the generator to the switchboard and tank circuits. If it excited while disconnected, but will not now do so, look for trouble in the circuit to the tanks, such as two tank rods touching each other, or acid-soaked wooden supporting frames having become sufficiently conducting to short-circuit the busbars they carry. Of course, with an interpole generator, if there is an ammeter connected in the main circuit of the generator such troubles will be evident enough, but in many cases no instrument of the kind is provided, or it may be out of action for some reason. If none of the above methods work, it is about time to send for an electrician to check up the field rheostat for broken connections, etc. Or there may be a "ground."

Voltage Too Low

If the voltage at normal speed is only about 2% to 6% of normal, it indicates that the field circuit is probably broken somewhere; since the machine is evidently running only on its residual magnetism. Are the connections between field rheostat, brush rocker or field broken, loose, or corroded? If armature or field get too hot as well, internal repairs are indicated as a rule. If violent sparking is also present, however, it may be well to check up the brush rocker position before assuming anything worse.

Unsteady Voltage

This may be caused by an intermittent break in the field circuit due to loose connections in cables to

field or field rheostat; or possibly intermittent breakdown of film or dirt or corrosion in switch or rheostat contacts, clamps on tank rods, etc. In this case, the variations of voltage are likely to be irregularly "jumpy." If the main ammeter needle swings rapidly instead of jumping irregularly, the belt may be slipping. The cure is obvious.

Sparking of Brushes

Several of the possible causes have been already described. May be due to overloading; bad bedding of brushes; loose brush studs; loose cable connections between pairs of brushes of the same polarity, (in cases where there are more than two brush studs); dirt and conducting dust bridging commutator bars or piling up against the heel of the brushes; etc. The first and last causes generally heat up the armature as well. Sparking may also be caused by the brushes sticking in their holders and thus not sliding freely. A rough, burnt or eccentric commutator may also be a cause. Apart from the above, internal troubles are about the likeliest reason.

Heating of Brushes

Excessive heating without any special sparking symptoms suggest excessive brush pressure on commutator, (usually due to an attempt to reduce sparking without first trying to find out what caused it). Heating and sparking combined suggest broken pigtails or other bad connections between brush and brush holder; wrong position of rocker; or "selective action" due to unequal resistance in the various brushes and their connections, or to loose brush studs. This will cause some brushes to shirk their load while others are overloaded. Internal troubles may also cause heating, sparking or both combined. Since, however, most heating troubles show up at the defective point itself, they are generally easy to trace.

Excessive Brush Wear

Any cause which produces sparking, heating or both, will tend to produce rapid brush wear also. In case of "selective action" the fault will be on the brushes which do not heat—since they are not carrying their fair share of current.

"Selective Action"

Although a more detailed explanation of "selective action" is not strictly within the limits of a "trouble-shooting" article, a typical case showing the serious effects possible may be interesting. It is evident that if we want to make sure that each brush is carrying its proper share of the load, its total resistance must conform closely to the resistance of each of the others. This total resistance consists of the contact resistance between the commutator and the running surface of the brush; the resistance of the brush itself; and the resistance of the pigtail and its connections. Now although all these separate resistances are exceedingly small, it must be remembered that the voltage of the generator is also small, while its current is much greater than that of an ordinary motor of the same size. Thus, a slight difference between the resistance of the brushes which would be inconsiderable on a 110 or 220 volt machine can have a most serious effect on current distribution in the brushes of a plating generator. Let us take a typical metal-graphite brush, (the M-6 type commonly used by platers). Its current capacity is 240 amperes for a .2 square inch area; its "contact drop" on full load is about half a volt; and its resistance from top to bottom is so small that it is only about two one-hundred-thousandths of an ohm. Suppose one brush is bedding so badly that only one-tenth of its area is in contact with the commutator. Its resistance is practically ten times what it should be, and nine-tenths of its current, or 216 amperes, must be carried by the rest of the brushes of the same polarity. This causes increased heating, sparking and wear on these overloaded brushes—their contact drop increases as the running surface gets cut up or burnt away—and soon another brush is "loafing on the job." Finally the entire set of brushes on one stud may be practically useless, and be shunting their load on those of the other studs. Care in proper bedding, and in seeing that all brushes are of the same grade will avoid most troubles of this kind. Never mix two grades at once on the same machine, for instance, in order to compare their relative suitability. The result of such a test is entirely valueless, in any case.

Double-Commutator Machines

These sometimes manifest a trouble not met with elsewhere. They may insist on sparking at one or both commutators even after all brushes have been properly bedded in, and other precautions taken as outlined.

The reason is probably that since both windings are on a common armature any change in brush position or conditions on one set of brushes is likely to affect the other. Therefore set one commutator and its brushes correctly; then the other. Changing conditions such as lead and bedding on one side or the other haphazardly **may** cure the trouble—but it probably **WONT.** Be systematic.

This article does not pretend to be a complete "trouble-shooting" manual. It merely attempts to describe the cure for the commoner troubles which are likely to occur in routine practice.

Tightening Inserts

Q.—I enclose an iron casting in which a wire insert is placed. These inserts are copper plated prior to placing in molds. This helps to prevent looseness of wire inserts in casting, but I continue to have a percentage of failures.

Is there any better method of preparing wires than copper-plating?

A.—I presume that the large percentage of failures you mention are due to the looseness of fit. There are three methods whereby this insert can be increased in diameter.

First: there can be a series of small notches, which will raise the surface from .001" to .010".

Second: the insert can be distorted by flattening a portion so that it fits tighter.

Third: it can be coated with a metallic liquid, preferably made of aluminum and heat treated to about 500 deg. F., to form metallization to the base. This coating can be applied so that the thickness ranges from .0005" up to .003".

I am basing my answer mainly on the point of increasing the diameter of the insert. Am I correct that this is the difficulty you are encountering?

—C. W. Hardy.

Direct Labor Cost of Finishing Operations

How to Obtain Control, Reduce Use and Compensate With Incentive for the Accomplishment.

By CHARLES W. HARDY
Industrial Consultant, New York.

THERE are many ways in which to obtain the cost of plating, lacquering, japanning, etc., operations. Some are complicated, unnecessary and costly; others are simple and practical and give the desired results.

Grinding, polishing, buffing, etc., are not difficult as they entail much more time in performing and are generally kept together while in process. They are therefore easily counted and recorded; besides which, this type of operation is generally paid for by wage payments other than time work. If labor is not paid on a time work basis, it is easy to obtain the cost of each operation if desirable.

Labor in Plating Involves Many Quick Operations

Plating labor is comprised of various quick processes and lots are small due to racking, handling, etc. Actual time of many individual operations is small and many of them are very much alike. Therefore, why try to get costs in a sequence such as: potash cleaning, in and out; rinse cold; rinse hot; acid dip; rinse cold; rinse hot; flash cyanide copper; brass plate in and out; rinse cold; rinse hot; cyanide; rinse cold; rinse hot; sawdust dry, etc.?

Average Overall Cost Per Unit of Quantity

In many plants in this industry it has been proved that an overall cost of plating and incidental operations (cost of all plating processes) works very satisfactorily and is easy to obtain and compile. All that is generally needed is the average cost per unit of quantity. Here is a simple method used by a large manufacturer of ladies' hand bag frames, that is entirely satisfactory and is quick, effective and devoid of red tape.

First: a record of production each day.

Second: a similar record of pay roll of those engaged directly on the work pertaining to the cleaning, rinsing, acid dipping, plating, scratch-brushing, drying, etc.

Third: these two factors are the basis of any cost of operations and are all that is needed. They are recorded on a form (one new sheet for each month) as follows:

Direct Labor Cost of Plating

Day	Quantity Gross Lots	Pay Roll	Av. Cost per Gross Daily	Av. Cost per Gross Accumulative	Remarks
3	20	$24.85	1.24	1.24	
4	22	26.20	1.19	1.21	
5	20	19.00	.95	1.13	1 helper laid off
6	18	19.65	1.09	1.12	
7	25	27.30	1.09	1.11	
9	16	17.00	1.06	1.11	Dipper discharged

The foreman knows at the end of the day the average cost per gross of frames made. He is the one who should know first and it is his job to keep the cost as low as possible. There are many ways in which this can be done and the one to do it is the foreman. Give him the necessary information and help and watch him go to it. As a rule a foreman plater doesn't know much about obtaining figures for cost purposes, but with a simple method as outlined above, he can have the facts easily, from a clerk or a bright boy or do it himself.

Verification of Cost

The average cost per unit of production should be checked once or twice every month. This can be done by a quick time study of each process with corresponding average calculated and then the separate operations added should equal the previous day's average.

Guessing at Plating Costs

This is a very bad habit. Management in many plants relies too much on the plater's knowledge of what this and that cost. But without some understandable method of recording the facts (quality and pay roll) and ascertaining the actual or average cost no plater or any other human being can guess right.

Experience has taught that with one figure to work with, such as an overall cost, a foreman is much more interested and knows what it is and generally goes into action to show better results, to lower the average. How much better then to give him a schedule of all the detail that goes to make up the total.

If you do not, but can keep a cost record of your finishing labor, try it for a few months. Work closely with the foreman in getting it started. Then watch the average cost come down. It is human nature to obtain results especially when they are recorded and are being watched by a superior.

May Be Necessary to "Break-Down" Plating Costs

Conditions, such as the kind of work, the operation variables, superiors, etc., sometimes make it necessary to "break-down" these averages. It may be necessary to get a separate average for wiring, stringing, hooking, etc., or for scratch-brushing or tumbling or dipping. Don't do it if all the work entails practically the same processes. If it is essential that some be separated just start a daily record of the process wanted, and when doing so, don't forget to deduct the labor from the total.

Controlling Labor Costs

Labor in finishing is an important factor and should be controlled as much as possible. It is complicated, however, when method of wage payments are other than by time work, although some large plants obtain good results when paying on piece work, points, premiums, and other forms of bonus plans. Unfortunately however, the mass of figures furnished the foreman are generally "over his head" and they are not used so far as he is concerned. There are of course, some exceptions to this statement as in some plants the plans function very satisfactorily and are thoroughly understood by all.

Estimating Plating Costs

When an average "overall" cost is kept for a few months, it is safe to use the last accumulative average figure in compiling an estimate of cost, but it is good practice to add a safety factor ranging from 5 to 15% even though the job looks as if it will require the same processes. If, however, it is certain to be easier and with less operations, a certain percentage should be deducted. This is where good judgment must be exercised, **but don't figure too low.** New jobs when put in work take on many unforeseen operations, that are not considered at time of estimating the cost. Then again until we know the job there is the cost of refinishing, etc.

Some Actual Savings

In one plant the daily pay roll was about $50 and the average cost per unit of production was $2.50. After three months of figuring the cost and better control of labor, it was $1.10 and the foreman did it all.

Another small plant was busy. The plating was the "bottle-neck," they had to work overtime; live steam during overtime was expensive and the company was losing money. The foreman's estimate of his labor was $7.00 per 1,000 pieces, which was entirely out of line. It should have cost about this much but it was actually costing over $18.00 per 1,000 pieces.

When he was shown the first week's daily average cost he claimed it couldn't cost so much, and the figures were wrong. When he was asked if he knew how much production had been made by his department during the week he said "No, but one of the boys in the plating keeps a record and I got it and the amount checked closely." He was then shown the payroll by dividing the quantity into the money, the average was as figured over $18.00 per 1,000 pieces. Still he was not convinced and started the following day with his own record. Within a week he agreed (partially) that it was costing much more than it should, and he promised to show results. Within a short time found out where most of the excessive cost occurred, he made some changes and now does some of the actual work himself. His daily average is now about $8.50 per 1,000 pieces. The foreman keeps all the records himself and is a more interested executive than he was before.

Lacquering, Japanning, Inspection and Packing Costs

The cost of these functions can be determined in exactly the same manner. If started, it generally is maintained. It doesn't require any extra help, it does not interfere with routine work, the calculations are simple and easily understood and in most cases, the average is lowered. This is a source of great pride to the one keeping the record or the one responsible for the activities of the department.

A Quick Way to Get Results—the Incentive

The monthly sheets should be retained. The foreman will refer to them and it is a "grand and glorious feeling" when the last entry is lower. A standard "Average Cost" should be set by management. A promise to the foreman of a raise in pay when the standard is reached—$5.00 a week more—makes a nice incentive for the foreman. **Caution:** don't make the standard unreasonable. Take your first few weeks' average and deduct from 20 to 33 1/3% and base your estimate on this amount. If a manufacturer can save 20% in his direct labor, he should be willing to give the foreman $5.00 a week more. If it works, insist on the record being maintained and watch it closely each day, each week or surely twice a month.

Tin Wash

Q.—We want to install a tin wash; some method we can use in a barrel.

A.—The following procedure may be used for depositing tin on steel tacks and nails:

1. Removal of oil and dirt either by electro-cleaning in alkaline cleaning solution or by the use of solvent and vapor degreasing. If electro-cleaner is used follow by hot water and cold water rinses.
2. Rolling in neutral soap solutions in a wood lined barrel or an open end oblique wood barrel to obtain bright finish. If hard water is used it may be necessary to soften by the addition of borax or soda ash.
3. After rolling rinse in clean hot and then cold running water.
4. Electro-clean in suitable brass wire mesh baskets or other suitable container. Rinse in clean hot water, then cold water; dip in 10% muriatic acid pickle; rinse in cold water; dip in cyanide pickle solution, 5 deg. Be; rinse in cold water and then place in plating barrel.
5. After tin plating the parts should be rinsed in clean cold running water. To obtain high lustre parts should be tumbled in an open end oblique wood barrel using a neutral soap solution. Rolling time should not be over 10 minutes.
6. After rolling in soap solution parts are rinsed in cold water and then rolled in cold hardwood sawdust in type of barrel mentioned to dry.
7. After drying in sawdust, parts are riddled to separate sawdust. The size of mesh in riddle depending upon size of parts.

The tin solution used is as follows:

Sodium stannate	24 ozs./gal.
Sodium acetate	4 ozs./gal.
Powdered rosin	3 ozs./gal.

Temperature 130 deg. F. Current density 12 amp. per sq. ft.

It is advisable to add small amounts daily of 100 volume hydrogen peroxide to oxidize the stannite salts back to stannate condition. This will prevent the building up of stannite salts.

Time of plating at least 30 minutes. The panels of the cylinder used in barrel must either be canvas or hard rubber with perforations of such a size to prevent parts coming through. All equipment and materials mentioned can be obtained from any reliable concern dealing in plating supplies.

—**T. H. Chamberlain.**

The Diesel Engine in the Plating Plant

By C. E. DIETLE
Fairbanks, Morse & Co.,
Chicago, Ill.

Economy in Power and Current Production. "Pay as You Earn".*

THE question is often asked: "Is the Diesel engine a recent invention—is it a type of machine that is new and unproven?" The answer is that the Diesel engine is not new—that the work of development was carried on prior to the time the gasoline engine was developed and became popular. The gasoline engine received the impetus which placed it in general use by the invention of the ignition system.

Dr. Rudolph Diesel

The Diesel engine is named after the man, Dr. Rudolph Diesel, who patented the first engine that embodied the principles of our present day engine. Actually, he was not the sole inventor. Prior to his patents independent investigators and designers had developed principles and designs in connection with the combustion or injection, ignition or scavenging of the fuels in internal combustion engines.

Mechanical Injection

An attempt was made by Dr. Diesel with direct, solid, mechanical injection of fuel. Difficulties were encountered that Dr. Diesel was not able to overcome and this method of injection was discarded. The advantages of direct, mechanical injection of fuel were fully realized and for years the efforts of designers were concentrated on the problem of perfecting this type of injection system. For many years now this type of injection has been fully developed and the extent of its satisfaction is shown by the modern trend to this system of injection both in Europe and this country.

Economy of Diesel Engine

The economy of a Diesel engine is due almost entirely to its efficient utilization of fuel. By burning of its fuel in the working cylinder under high pressure a thermal (heat) efficiency of 33% is easily attained. A modern high pressure steam plant with condensers, and all modern devices for heat recovery has an overall thermal efficiency from 11 to 20% (depending upon the size).

The efficiency of the Diesel plant is not dependent upon the size of the unit, because thermal efficiency is not dependent upon the size of the unit. As a comparison the economy of a small 10 horsepower Diesel is nearly as fine as a large 5000 HP. unit. The attendance required in a Diesel plant is less than any other type of prime mover except electric motors. When Diesel engines are compared with gasoline engines it is usually found that the Diesel will operate for 25 to 30% of the cost of the gasoline engines.

* From a Paper read at the Third Quarterly Conference of the Master Electro-Platers' Association of the Mid-West, in Toledo, Ohio, March 28-29, 1936.

Survey Made for Electroplating Plant

In order to keep this address close to the subject assigned I have taken a medium sized electroplating plant as an example. The charts which I have prepared show: 1. Annual consumption is 120,000 KWH; 2. Annual cost when purchased from local utility is $5,254; 3. Cost of energy when generated with Diesel power is $1,700; 4. Value of waste heat which can be recovered for plant heating is $135; 5. Total saving by use of Diesel equipment is $3,680 per year.

Assuming that the owner wished to consider that the Diesel Equipment must be completely written off by the end of ten years, we have the following summary:

1.	Value of savings at end of 10th year—compounded annually at 6%		$48,623
2.	Cost of Plant	$12,000	
3.	Value of interest for 10 yrs. at 6% (compounded annually.)	$9,318	
	Cost to own plant	$21,318	
			$21,318
	Profit to Owner		$27,305

Life of Diesel Plant

In the foregoing figure it is assumed that the engine will be in need of replacement at the end of 10 years. This is not likely to be the case. Government projects on which Diesels are used consider the average life as 20 years. Experience in actual operation shows that when properly maintained a Diesel engine has an indefinitely long life.

In the plant under consideration the above figures clearly demonstrate the feasibility of this type of power.

Operations Costs

To the question, "What will it cost me to generate power with Diesels in my plant?" there is no one answer. The cost is controlled by many variable factors. These factors are labor, or attendance required; running load factor; number of hours operated per year; location of plant. The only answer to the question concerning costs is "Each job must be engineered separately before the cost of operation can be determined."

The Plant Pays You

The next question that must be foremost in your

minds is doubtless, "Can we acquire a Diesel plant without depleting our reserve resources?" The answer is, "Yes!" Diesel engines are sold because of the savings they can effect for their owners. A small down-payment is required and the balance may be paid monthly as the savings accrue. Under this method of financing the purchaser's actual investment is only the amount of his down-payment.

The increased interest displayed by the public at large has been caused by the realization that it does not cost anything to own your own Diesel power plant—it pays you instead of costing you.

From Silver to Silver Cyanide

Q.—I HAVE some pure silver metal, and want to know how to make it into silver cyanide, for use in a silver plating bath.

A.—This process is not easy for an inexperienced worker to follow, as there is danger of losing silver unless you work with great patience. That is why most people buy the ready-prepared salts.

Briefly, the process is as follows: (A) convert the metallic silver into silver nitrate: (B) from it precipitate the single salt, silver cyanide, AgCN, and wash it well; (C) dissolve the single salt in more cyanide in order to obtain the double salt, $KAg(CN)_2$, which is the salt used in silver plating.

(A) Conversion

For a gallon of plating solution, take 2 troy ounces of pure silver, roll it thin, twist the strips so they will not lie flat, place them in an evaporating dish or porcelain casserole, and cover them with nitric acid. Dilute the acid with about one-third water. Ordinary tap water contains salts that cause a cloudiness in the solution, but this does no harm (beyond worrying the inexperienced worker) and so tap water is commonly used. However, if you have distilled water on hand, use it.

Usually the acid goes to work at once; in cold weather you may have to warm it a little. Dangerous fumes appear, so work near a flue or fan. Do not use any more acid than necessary; this is accomplished by adding the acid a little at a time, and leaving a small piece of silver undissolved.

Next, evaporate the solution slowly to dryness to drive off any unused nitric acid. Do not overheat. White crystals of silver nitrate will be seen as the liquid cools. If you started work with pure silver, and use pure nitric acid, you should now have silver nitrate of such purity that no repurification of these crystals is called for.

(B) Precipitation

Wash the silver nitrate into a big jar, and make up to about ½ gallon with water, preferably distilled. In a separate vessel dissolve about 4 ounces avoirdupois of potassium cyanide, in ½ gallon of water. Sodium cyanide is cheaper and goes further, but many workers maintain that potassium cyanide gives better results. Cyanide alters on standing, and changes strength, so it is impossible to say exactly how much will be necessary. Now add a little of the cyanide solution to the silver nitrate solution, and stir. Do not breathe any fumes that may appear—they are especially dangerous if your nitrate contains any unused nitric acid.

The heavy white insoluble salt, silver cyanide, AgCN, will settle slowly. Use only just enough cyanide solution to convert all the silver into the solid form; this is hard to do because you do not know exactly how much cyanide will do the work. Most workers add too much and thereby waste silver. So work slowly, add a little cyanide and then let the mixture settle in a dark place; then add another drop or two of cyanide and see if it produces more of the white precipitate; if so, add a few more drops and let settle again. Finally you will find that no more white cloud forms; this will probably use up about a third of your cyanide solution, more or less, according to its strength.

Now set the jar aside until all the white stuff has setled well, then pour off the clear solution, which should be of no value. (If you used too much cyanide it will contain a little silver.) Now you must wash this white sediment by filling the jar with clean water, stirring well, and letting it settle again. Pour off the clear wash-water and throw it away. Repeat this washing two or three times, and leave the silver cyanide sediment in the jar.

(C) Solution in Cyanide

Next, dissolve this washed silver cyanide in the potassium cyanide solution, watching to see how much solution you use. You can keep a record of this by having the cyanide solution in a graduate and pouring from it, very slowly, stirring all the time, until the last grain of white sediment dissolves. Note how many ounces of the liquid were required. It will probably be about one-half of what remained from process B.

Your jar now contains a solution of the double salt $KAg(CN)_2$, called potassium-silver-cyanide. If you had been working with sodium cyanide it would now be the sodium-silver-cyanide, $NaAg(CN)_2$. These are the essential salts in sliver-plating baths.

For successful plating, other substances are added, primarily a certain amount of "free" cyanide. Therefore, for each ounce of solution that you poured out of your graduate in process C, add 1/5 of an ounce more of that same cyanide solution. This constitutes the "free" cyanide. Let settle; usually there is a slight precipitate that should be filtered out and discarded. Your complex silver cyanide is now ready for use; add enough water to bring the volume to a gallon. Possibly you will want to add a "brightener" or other ingredient, but this point would come outside the range of your original question.

—**Jewelry Metallurgist.**

Cyanide Poisoning

By K. K. CHEN, C. L. ROSE and G. H. A. CLOWES

A New Method of Treatment, Approved by Dr. W. F. Von Oettinger, Haskel Laboratory of Industrial Toxicology*.

THE method advocated depends upon Hug's and the author's laboratory work previously published. The antidote chiefly consists of a combination of sodium nitrate and sodium thiosulphate, injected intravenously one after the other. Such a combination can detoxify 20 minimal lethal doses of sodium cyanide in dogs, and is ten times as effective as methylene blue. To expedite the treatment, amyl nitrate is also used by inhalation. The recommended dose for sodium nitrate is 0.3 gm. in 10 cc. water (3 per cent), and that for sodium thiosulphate 25 gm. in 50 cc. of water (50 per cent), although an amount of 12.5 gm. in the same volume of water (25 per cent) is frequently enough. In cases of relapses, one-half of the quantity of each should be repeated.

In order to make the treatment most effective, it is suggested that a kit containing 12 pearls of amyl nitrate, 2 ampules of sodium nitrate, 2 ampules of sodium thiosulphate, 2 sterile syringes, 10 cc. and 50 cc. sizes, respectively, 1 file and 1 stomach tube be installed in the ambulance, as is practiced at the Indianapolis City Hospital, or in any place where it is most easily accessible. These ampules have proved to be stable for more than a year with appropriate preservatives and the usual precaution. A team of three individuals is necessary for the best management of a case of cyanide poisoning.

The rapidity of death from cyanide poisoning has been justly emphasized in teaching and textbooks, for most patients do die within 30 to 60 minutes. On the other hand, one must also remember that many others may linger for several hours. One patient, for instance, did not die instantly but lived a little more than three hours. There is generally considerable cyanosis in man, and symptoms or unconsciousness may be present for two or three hours, which ordinarily will be ample time for administering treatment suggested. The combined therapy with sodium nitrate and sodium thiosulphate has saved dogs even after their respiration has ceased. It is reasonable to assume that this also holds true in men. As long as the victim's heart still beats, the clinician should consider the case hopeful and treat it without delay.

New Antidote

With a better understanding of cyanide poisoning, it has been necessary to change the antidote. The new antidote given below should be referred to the medical units of industrial plants using Cyanides.

* From the Journal of the American Pharmaceutical Association, 24, 625 (1935); Modern Metal Finishing, June, 1936, R. & H. Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Dela.

Antidote

Always have on hand a liter of a 1 per cent solution of Sodium Thiosulfate and a carton of Amyl Nitrate Pearls.

Directions for Treatment

1. Have patient inhale content of an Amyl Nitrate Pearl.
2. Cause vomiting by giving soap water or mustard water.
3. Give 500 cc. Sodium Thiosulfate solution by mouth.

Repeat the above procedure every fifteen minutes. If necessary, give artificial respiration until physician arrives.

Handling Cyanide

General Precautions

1. Keep cyanide away from all acids.
2. Always wear dry, cotton gloves when handling cyanide.
3. Be sure that cyanide never comes in contact with open wounds or skin abrasions.
4. Always wash the hands thoroughly with running water after handling cyanide.
5. Food should never be stored, handled, or consumed during cyanide operations.
6. No fire hazard is involved in the handling of cyanide.
7. When handling cyanide solutions or articles coming from cyanide solutions, always use rubber gloves.

Removal from Containers

1. Observe all the precautions given above.
2. If possible, it is better to open the container in the building or room where it is to be used. Any unopened drums will be in storage.
3. Remove the cover from the container and preferably store the cyanide in the original container until used.
4. When not in use, cover the original container with the original cover or a metal substitute.
5. In removing cyanide from a container, use a metal scoop or gloved hands or dump from the container as required. If dumped into a solution of cyanide, beware of splashes of the solution into the face.
6. If the cyanide is fused in a solid block in the container, first crack up the product by hitting with a sledge before opening. When once opened, replace cover and crack up the cyanide before reopening.

Editorial Comment

Shop Requirements for Quality Plating

"QUALITY" is now a watchword—the leading sales "talking point" in the manufacturing industries. Nothing is so generally claimed—and so often missed. In the electroplating and metal finishing operations, this condition is especially rife as standards are still so nebulous and so little understood.

We all know, of course, that many shops do produce quality plating. Their methods are not mysterious or magical. The principle is perfectly simple—close attention to every detail. At no time has this ever been made clearer than in the paper entitled, "Some Requirements to Obtain Quality in a Job Plating Shop" read by **Carl Heussner** of the Chrysler Corporation, at a recent meeting of the Master Electro-Platers' Association of the Midwest. Mr. Heussner, who speaks with acknowledged authority, points out the fundamentals required for quality plating, which are very briefly, as follows:

1. Capable and experienced personnel.

2. Cleanliness throughout the plant: floors, walls, electrical mechanism, anodes, solutions, cleaners, rinse waters—in other words, everywhere from the receiving through the shipping department.

3. Keep generators as close as possible to the point of operation. Loads on copper bus bars should not exceed 1000 amperes per sq. inch of copper on very short lines, and 500 on long haul lines. Where a generator serves more than one tank, rheostats, ammeters, and voltmeters should be installed upon individual tanks.

4. Accurate knowledge of the grain that is used on the polishing wheels, to eliminate all stray grain on the surface. Wheels properly cured after re-working. Speed of wheels regulated to conform to the type of work; (higher speed for harder metal and lower speeds for soft). Eliminate all oxide pits in the base metal during preliminary polishing. Die cast parts should be polished only at gates and parting lines, the balance of the finish to be done only on a buffing wheel. Don't start polishing operations with too coarse a wheel. Unless it is heat treated stock it is seldom, if ever, necessary to start with a grain coarser than No. 120. Vary speed of wheel in buffing with the type of metal; (high speed for hard metal and lower speed for soft metal). Care in buffing edges and corners to avoid cutting through. Good nickel buffing eliminates at least 50% of the chromium buffing. Keep the polishing department clean and well lighted. Dust collectors should eliminate practically all of the polishing grit and dirt from the wheel.

5. Adequate exhaust system for plating department to remove fumes. Ventilation should prevent back spray from the roof or window that can be carried into the polishing department. Segregate chromium plating from other plating operations, and also, if possible, operate chromium tanks from an individual generator.

6. Cyanide copper can be plated in the steel tank. Keep bath clean by filtration; cover anodes with bags or sheet to prevent transfer of metallic particles to the work. The average efficiency of a cyanide copper solution is not over 40%. Equip the bath with heating coils. Keep a minimum of several inches working space between anodes and cathodes.

7. Nickel tanks require rubber or lead lining for hot solutions; cold solutions may be used in a pitch lined tank. Solution should be properly heated, current controlled, anodes bagged and solutions filtered. Keep solutions free from iron, copper and zinc. Do not use excessive amounts of hydrogen peroxide. Remember that the pH depends upon the metal concentration of the bath; peeling and cracking of the nickel deposit will result from improper hydrogen ion concentration. In die cast nickel solutions keep sodium sulphate content within reasonable limits; an excess causing cracking. Use high purity anodes. Filter the solution frequently.

8. Chromium baths should be fitted with both heating and cooling equipment; keep clean and free from contamination.

9. Cleaning baths should be frequently renewed and not allowed to accumulate excessive quantities of dirt. Rinses should have a free flow of water and in most cases be used for only one type of operation. For example, do not use the same rinse before copper plating, after copper plating and after nickel plating.

10. Proper racks are indispensable to prevent burning, loss of current, allow metal to throw into recesses and permit rapid racking and unracking. Insulate as much as possible the rack from the bath.

11. Arrange plant to permit a free flow of the incoming material to the inspection and polishing department, and transfer through the various operations with the least amount of effort, walking, etc. Rinses, acid dips and plating baths should be close together to avoid exposing work to the atmosphere for an excessive time.

12. Technical control is very essential; analysis, interpretation of the analysis and bath additions. Plating baths should be analyzed at least once a week. Control cleaners, acid dips, hardness and contamination from the water supply, etc. Inspect the finished part to check the amount of metal deposited. Make cyanide determinations and pH determinations daily.

All of the above can again be summarized: intelligent personnel, proper equipment, efficient layout, control of solutions and cleanliness, cleanliness, cleanliness!

Business in the Summer

JULY and August are dull months in our industry. A periodic let down is normal. From all indications, however, the recession this year seeems to be of smaller proportions than expected.

The National Industrial Conference Board reports an advance of business activity in May, June and July, and the Cleveland Trust Company reports that July showed an increase and that activity continued vigorously during August. The automobile industry has shown considerably less than the usual seasonal decline. Residential contracts awarded show a greater percentage of gain over the same period a year ago than most of the other business indicators. The high rate of activity in the iron and steel industry constitutes one of the most significant factors in improvement. The machine tool industry has been operating at a high rate. Electrical power production has advanced steadily and output has reached record high levels. Electrical manufacturing industries, always of interest to metal manufacturers, seem to be having no summer slump.

At this time the prospects for a good Fall are very bright.

Correspondence and Discussion

Courses in Electroplating

To the Editor of **Metal Industry**:

Many of your readers desire information concerning the electroplating courses which are offered at Columbia University, 116th Street and Broadway, New York, during the school year. For their information I submit below an outline of such courses, and any further information can be obtained by calling Dr. Young at STillwell 4-8885 during the day.

Chemical Engineering e83 Electroplating (Industrial Chemistry). Meets each Tuesday and Wednesday night in Room 356, Chandler Hall. The course is designed to give the electroplater or industrial worker a foundation in chemistry. One hour of each lecture is used to discuss the modern theories of chemistry. The two remaining hours are utilized by the student in conducting his experiments under the supervision of the instructor. This course should precede **Chemical Engineering e84—Practical Electroplating,** which begins in the Spring Session.

Chemical Engineering e84 "Practical Electroplating." This course is designed to give the practical electroplater a study of ways and means of obtaining better deposits by applying the latest scientific methods of electrochemistry to electroplating. One hour of each evening is devoted to a lecture by the instructor, and the remaining two hours are devoted to the application of these principles by the student in the laboratory. The cost of each of these courses is a fee of $20.00, plus a small laboratory or breakage deposit.

In order to take care of students who desire further training, **Chemical Engineering e85 and e86, "Investigation of Special Problems in Electrochemistry"** has been established. The course is designed to give the practical electroplater or electrochemist a chance to investigate certain problems which are related to his field of work. One-half hour of each evening is devoted to a conference with the instructor, and the remaining two and one-half hours are spent in the laboratory where the student applies his knowledge and technique to the solving of problems which arise in such an investigation. The charge for these courses is a fee of $30.00 for each semester plus a deposit for breakage of $10.00. Registration begins September 19th and ends September 26th.

DR. C. B. F. YOUNG.

Technical Papers

ELECTROLYSIS OF SILVER-BEARING THIOSULPHATE SOLUTION

By K. Hickman, W. Weyerts, and O. E. Goehler

Eastern Kodak Company, Rochester, N. Y.

From Industrial and Engineering Chemistry, Vol. 25, pages 202-212, February, 1933.

Editor's Note: Large quantities of silver are employed in photography, at least 100 tons of silver halides being dissolved annually in America alone in thiosulphate ("hypo") baths.

Several ways of recovering this silver are in use, and by an unfortunate co-incidence, at least three essentially different methods are commonly referred to as "electrolytic." This has brought about confusion both in the literature and among users. This article attempts first to clear up this confusion regarding the term "electrolytic," and then to review briefly a method worked out by Eastman Kodak Company chemists, which is now being employed in large scale operations.

When silver is to be recovered from ordinary quantities of old hypo baths, such as accumulate in the average photo shop, the commonest procedure is to add sodium sulphide, which immediately precipitates the black silver sulphide. This is smelted with a flux that reduces it to metallic silver, the result normally being somewhat impure. The remaining liquid is discarded.

A second method, equally applicable to small or medium-sized lots, calls for the addition of metallic zinc, which gradually dissolves and displaces the silver in the form of metallic granules, called "cement silver." This method is cleaner than the sulphide method, but takes longer. The cement silver is melted into a button, which is also often of doubtful purity. Since the reaction between the zinc and the dissolved silver depends upon the fact that zinc is higher than silver in the electromotive series of metals, the method is loosely referred to as an "electrolytic" method, even though no generator is involved.

Indeed, the name "Electrolytic Unit" has been given to a prepared device, which when immersed in an old hypo bath will collect silver upon itself, the solution being saved for re-use. Such a device is being provided by a well-known refiner for the use of his clients; it utilizes in a convenient form the principle that is employed when zinc dissolves to displace cement silver, or when jewelry is lightly gilded by the old method of simple immersion.

In all the above methods, the metallic silver as first obtained is of doubtful quality, and usually is sent to a refinery for further treatment. When large quantities of such silver are available, the most popular methods of purifying it are the Thum and Moebius processes. These are true electrolytic methods, employing electric generators, an electrolyte, a heavy current of electricity, etc. The impure metal is made the anode in an acid bath, it is carried into solution by an electric current, and is then deposited out again on a cathode as pure silver; the impurities collect in the electrolyte.

In the paper under consideration, another method of handling old hypo baths is described. It is truly electrolytic, in that the bath is traversed by an electric current provided by a generator, and silver is deposited on the cathode. The equipment required is extensive, and rigid control of the process is imperative; hence the method is one that is fitted primarily for the large establishment. It has found successful application where large quantities of motion picture film are being treated.

It is understood that the Eastman Kodak Company controls patents covering both the principles and the details of this method of silver recovery.—Ed.

The process is carried on in large cells containing 100 square feet of cathode surface, through which a current of 300 amperes is passed at 1 to 1.5 volts. At the anode, thiosulphate (hypo) is oxidized to tetrathionate and trithionate sulphate; at the cathode silver is deposited with small inclusions of silver sulphide and gelatin from the film; some of the tetrathionate is reduced to thiosulphate, which is then available for re-use.

The electroplating efficiency varies between 65% and 80% in large installations, and the yield per million feet of film is about 1200 ounces of silver. By utilizing the solutions from which silver has been removed, the consumption of fixing baths is reduced to 35% of that previously demanded.

When a simple silver-bearing thiosulphate solution is electrolyzed under ordinary conditions—with fixed electrodes, for example—as soon as the current is applied a stream of brown colloidal silver sulphide falls away from the cathode, yielding a dirty unfilterable liquid. For this reason earlier workers dismissed as impracticable the electrolysis of hypo solutions.

However, by strictly regulating several factors, electrolysis can be accomplished with the deposition of high-purity, mirror-bright silver. Vigorous agitation, together with proper concentration of acid, sulphite, and certain promoting agents, is essential.

The great variety of substances in a solution that purports to contain thiosulphate, is remarkable. The way in which they combine and recombine with each other is bewilderingly complex, but the final result of the electrolysis, when properly controlled, is to deposit silver —plus small quantities of sulphide and gelatin—on the cathode, and thiosulphate is reformed in the bath, the salt lost by decomposition to sulphur and sulphate being small. If proper control is not applied, the results will be silver sulphide, sulphur, and other undesirable materials.

This article describes first the experimental set-up with which the conditions necessary to successful plating were worked out. Agitation is essential; the lower the silver concentration the

greater the agitation required. Baths secured in industry always contain gelatin, soaked from the film, and it was found that this gelatin, or at least some product appearing on its partial decomposition, alters the course of the electrolysis. The exact nature of this product, which acts as a promoter, is not yet determined.

Three different arrangements of large size plants, all now in use, are described fully. In general, cells should be as large as will pass through a doorway, and the cathode assemblies, plus their load of deposited silver, should not be too heavy to be lifted by hand. The choice of building materials for the cells was found to be difficult, partly because of the corrosive action of acid hypo solutions, and also because, as the action proceeds, silver tends to deposit and spread from any spot where the cathodes touch the wall, eventually causing short circuits. This was especially noticeable with wood; polished hard rubber and burnished celluloid offended least in this respect. Rubber is recommended for supply pipes, plain wood for storage tanks and plating tanks where there is no contact between walls and cathodes below the surface of the solution, or metal lined with hard rubber. In some cases strips of celluloid (film) were used to prevent short-circuiting from creeping deposits of silver.

Carbon or graphite anodes are used, usually in the form of rods. The cathode may be of Monel metal or Allegheny metal; it is left in the solution until 10 to 20 pounds of silver-gelatin complex have accumulated upon it, then it is lifted out, rinsed, and dried; the silver complex contracts as it dries, and splits away from the cathode, which after half an hour or so is ready to be used again. The silver complex is then melted in 100-lb. lots in an iron crucible, with a little nitre. In the first six months of operation, the Metro-Goldwyn-Mayer plant at Culver City, California, with one tailing and four working cells, recovered 60,000 ounces of silver. There was a saving of 65% in fixing and precipitating chemicals.

Agitation may be secured by means of air or gas bubbled between the electrodes, by rotating either anodes or cathodes, by paddles between electrodes, or by external paddle or pump stirring. For large installations, inter-electrode stirring, if short-circuiting is eliminated, is probably most efficient.

The current that can be tolerated increases greatly with smaller electrodes, since they permit better agitation of solution. Hence various schemes of breaking up the cathode are employed, such as the use of wire, netting, strips, or comb-like sets of strips.

One plant is described as being suitable for batch-working in developing and printing establishments, and the cell arrangement is illustrated. The cell shown is of wood, about 20 inches wide, 14 inches deep, 5 feet long, open at the top and fitted with a vertical partition running lengthwise down the center of the cell. At each end the partition is cut away to make a passage for the solution, which is circulated by a portable motor stirrer. The latter is mounted at an angle on the edge of the cell in such a manner that the propeller can rotate in the circular opening in a hard rubber baffle, molded to fit. The anodes are arc lamp carbons thrust through holes in wooden blocks that rest on the top of the cell. The cathodes, which can be of wire, netting, or comb-like sets of strip, are secured to a second set of wooden cross blocks. Assuming fifteen to twenty electrode pairs, and a charge of 75 gallons of solution containing 0.5 ounces of silver to the gallon, a current of 75 to 100 amperes can be passed. Silver can be allowed to accumulate in the cathode strips till it is almost ready to peel while in solution.

The authors also suggest that perhaps this process can be used in mining and metallurgy, to replace the dangerous silver cyanide solutions; giant cells for this purpose might be stirred by means of the waste sulphurous flue gases.—

C. M. Hoke.

Copper Wire Tables. Circular C 31. National Bureau of Standards. Obtainable from the Superintendent of Documents, Washington, D. C. Price 20c.

Acid Resistance of Vitreous Enamels. Technical News Bulletin of the National Bureau of Standards, Washington, D. C., August, 1936, page 74.

Some Studies in Microstructure of Zinc Coatings, by **W. E. Buck.** A paper presented at the annual meeting of the American Zinc Institute, 60 E. 42nd St., New York.

Opacifiers in Wet and Dry Enamels, by **Dr. Ing. L. Stuckert.** Series A, Number 42. Technical Publications of the International Tin Research and Development Council, 149 Broadway, N. Y.

Welding Research

The Sub-Committee on Industrial Research of the Engineering Foundation Welding Research Committee, held a two-day session, July 23-24 at Watertown Arsenal, Watertown, Mass. Colonel G. F. Jenks, Commanding Officer of the Arsenal and Chairman of the Subcommittee, presided at the various sessions. The purpose of the conference was to complete the organization of the committees preliminary to the analysis of the research activities being conducted. Papers were read on Radiography, Monel Metal, etc.

Among the committees arranged for were:

Aluminum Alloys, G. O. Hoglund, chairman.

Copper Alloys, D. K. Crampton, chairman.

Nickel Alloys, O. B. J. Fraser, chairman.

Information can be obtained from the Engineering Foundation, 29 W. 39th St., N. Y. City.

New Books

Alloys of Iron and Carbon, by Samuel Epstein. Published for Engineering Foundation by McGraw Hill Book Company, Inc. Size 6 x 9; 476 pages. Price $5.00.

The Engineering Foundation is the sponsor of a series of monographs entitled "Alloys of Iron Research" with Frank T. Sisco as Editor. This book is Volume 1 on Constitution and Heat Treatment, prepared at the Battelle Memorial Institute as a part of their contribution to the Research.

This monograph is of value as a correlation of fundamental data on carbon steels and cast iron and as a "base line" for evaluating the effects of other alloying elements. Important features are the explanations of the more important phenomena when iron carbon alloys are heat treated or cooled, which are valid for almost all of the alloy steels.

Among the chapters are the following: General Features of the Iron-Iron Carbide Diagram; Correlation of Data for the Selected Iron-Iron Carbide Diagram; The Iron-Graphite Diagram; Arrested Transformations, Principles Underlying Hardening; Changes on Tempering Iron-Carbon Alloys; The Structure of Iron and Steel; Effect of Mass and Furnace Atmosphere in Heat Treatment; Operations of Quenching, Tempering and Carburizing; Factors Affecting the Quality of Commercial Iron-Carbon Alloys.

Government Publications

Platinum and Allied Metals in 1935—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Hack-Saw Blades; Simplified Practice Recommendation R90-29; before the industry for acceptance. National Bureau of Standards, Washington, D. C.

Report on the Works Program of the Works Progress Administration; also special booklet, "Interesting Facts About W.P.A." Works Progress Administration, Washington, D. C.

Consumption of Tin in the Tin Plate and Terne Plate Industry in 1935—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

White Base Antifriction Bearing Metals

Sales of white base antifriction bearing metals by 39 manufacturers reporting to the Bureau of the Census, Department of Commerce, amounted to 2,312,436 pounds in May, 1936 compared with 2,413,979 pounds in April; 1,839,719 pounds in May, 1935 and 1,961,494 in May, 1934. These manufacturers produced about 84% of the total value of the output of the industry.

Sales for the first five months of 1936 were 11,314,072 pounds against 9,012,704 for the same period of 1935.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice

METALLURGICAL, FOUNDRY, ROLLING MILL, MECHANICAL, ELECTRO-PLATING, POLISHING, AND METAL FINISHING

Associate Editors

H. M. ST. JOHN
W. J. PETTIS
W. J. REARDON
W. B. FRANCIS
T. H. CHAMBERLAIN
WALTER FRAINE
G. BYRON HOGABOOM

Black on Name Plates

Q.—We have noticed in an old issue of the "Platers' Guidebook" an article stating that you maintain a Shop Problem Dept. Having recently partially installed equipped for the manufacture of etched name-plates, we are desirous of obtaining a complete description of the process so we could check it with information we already possess.

Particularly, we are interested in finding the correct, modern method of blackening or coloring the backgrounds of the plates. The various chemical formulae for plating the background we find unsatisfactory, since the solutions must be used hot, and for this reason invariably lifts the resist. We know there is some method of filling the background with lacquer or enamel, but are entirely unfamiliar with this process.

A.—Two methods can be suggested here for use on this type of work.

A solution for black nickel plating appears on page 20 of the Platers' Guidebook, as follows:

Single nickel salts	10 ozs.
Double nickel salts	6 ozs.
Zinc sulphate	5 ozs.
Sodium thiocyanate	2 ozs.
Water	1 gal.

Use at room temperature. Gas carbon anodes. Low voltage, not over ¾ volt.

An immersion black solution appears on page 34:

Copper carbonate	1 lb.
Ammonium hydroxide	1 qt.
Water	3 qts.

Use warm, 175 deg. F.

In the black nickel solution the same resist that has been used in the etching can be used in the plating.

—G. B. H., Jr., Problem 5,525.

Bright Dip for Brass

Q.—We are bright dipping a small solid brass article, and our plater has been using a bright dip formula of two parts by fluid measurements of sulphuric acid, and one part nitric acid. He has gradually changed this formula until now he is using 4 parts nitric, and one part sulphuric, claiming with an exhaust equipment, he can perform faster work.

We would appreciate you advising us the correct basis, and we wish also to know if there is any hazard in mixing these two acids in such proportions as he is now using.

A.—The use of the ordinary bright dip for brass which usually is made up of two parts of sulphuric acid and one part of nitric acid produces a smooth uniform finish with only a small amount of metal going into solution. As the nitric acid content is increased the action of the bath becomes faster resulting in more metal going into the solution with the finish becoming rough and cloudy. The bath will heat up to a greater degree which necessitates faster cooling or action will become still faster.

There is no danger in mixing these acids in proportions mentioned provided that bath is kept cool and well exhausted. The fumes from a bath of this mixture are of a poisonous nature and sometimes come off in large volume necessitating excellent and adequate exhaust.

—T. H. C., Problem 5,526.

Copper Analysis

Q.—Can you please send me a rough list of parts necessary for constructing a single unit apparatus for the electrolytic determination of copper in cyanide copper plating solutions. Possibly you can tell me the approximate cost of same or advise me where such a unit can be purchased without paying "drugstore" prices, so to speak.

I am doing plating with copper carbonate-cyanide solution on parts which are subsequently carburized. The copper must prevent the penetration of carbon into the low-carbon steel at the ordinary carburizing temperature of 1650 deg. F. I test for thickness of deposit with a drop of 1-1 HNO_3 Sol. and if copper is removed in 45 seconds it is not considered satisfactory. I have had some trouble. I noticed that the anodes get very black after a few hours run and would like to have your suggestion on this. Also I am sending you a 4 oz. sample of my solution and wish you would advise me immediately if possible regarding its condition.

A.—A complete description of the apparatus and the procedure for determination of copper electrolytically can be found in "Principles of Electroplating & Electroforming" by Blum & Hogaboom, and which may be purchased through **Metal Industry**. In general, the apparatus consists simply of a platinum gauze cathode and a platinum anode. A copper gauze cathode and a lead anode may be used, however, and of course are much less expensive.

The best source of current is one cell of a storage battery. The current can be regulated by means of a rheostat.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date..............................

Name .... Class of work being plated: ....

Address .... Volume used: ....

Employed by: .... Solution depth: ....

Kind of solution: .... Cathode surface, sq. ft.: ....

Tank length: .... width: .... Kind of anodes: ....

Anode surface, sq. ft.: .... Distance from cathode ...... Original formula of solution: ....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary. ______________________________

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

Use an ammeter and voltmeter as in regular plating. The current handled will not be over about 2 amperes.

The chemical supply houses will furnish complete units for electro-analysis.

Analysis of cyanide copper solution:

Copper	3.78 ozs./gal.
Free sodium cyanide	.10 ozs./gal.

The metal is somewhat high, the cyanide too low. Remove one-third of the solution, replace with water, then add 1 oz./gal. of sodium cyanide.

The proper metal content of a good cyanide copper solution is about 2 ozs./gal. The free cyanide content for this amount of copper is about 1 oz./gal. This does not mean, however, that a good solution will be had if only the ratio of cyanide to copper is maintained in that proportion. It is best to keep the copper and free cyanide at constant figures rather than shifting one or the other in an attempt to maintain any given ratio.

—G. B. H., Jr., Problem 5,527.

Copper in Nickel Solution

Q.—I am taking the liberty of sending you a sample of nickel solution and also a piece of work plated in it, this is a new solution containing:

12 oz. double nickel salts
4 oz. single nickel salts
2 oz. sodium chloride
2 oz. boric acid
1 gal. water
2 gal. brightener

The tank I am using is a 184 gal. tank which was formerly used as a copper cyanide and I am under the impression that I didn't get all the cyanide out.

A.—The trouble with the solution is copper, as you have surmised.

At present the solution analyzes:

Nickel	2.17 ozs./gal.
Chloride, as ammonium chloride	1.88 ozs./gal.
pH	6.8

It is quite doubtful if you will be able to remove the copper entirely from this solution as some will always be taken up from the tank, at least for a considerable period of time.

Copper can be removed from a nickel solution by first making the solution acid with sulphuric acid. Your solution is already quite alkaline, as shown by the pH of 6.8 and you will therefor need about one quart of sulphuric acid to bring the solution to a distinctly acid condition.

The copper can then be removed by working the solution with dummy cathodes. Plate with as much current as the cathodes will take and for an extended period of time—at least during one working day.

The best thing to do at this point is to remove a portion of the solution, place in a crock and then neutralize the acid with ammonia and adjust the pH to 5.8. Then try a piece of work in the crock. If it shows copper streaks or a black deposit then the solution in the main tank will have to be further electrolyzed, until all copper is removed. Then correct pH.

Another method is to make solution acid, pH 5.0, and hang in some scrap steel to cement out copper.

We do not know what kind of a brightener is given in your formula. This material may have some effect that is difficult to predict. If more samples are sent for analysis kindly explain what this brightener is.

—G. B. H., Jr., Problem 5,528.

Refining Scrap Zinc

Q.—We are particularly interested in the best method for refining zinc and die cast scrap and casting same after refining, into regulation slab moulds for the trade. At present we are having a little trouble with iron going into solution.

A.—In our files we have the following that may help you. It was published a number of years ago and looks very practical to us.

Refining Zinc Dross

The reclaiming of the zinc from zinc-dross was formerly carried out by distillation the same as zinc is produced from the ore, but unless one operates a zinc smelter, this is costly. To the late Joseph Richards of the Delaware Metal Refinery is due a process for refining zinc dross that is quite unique. For many years he was able to keep it secret, but it finally leaked out, and is used elsewhere for treatment of the dross. The process is not patented.

The Richards process is based upon experiments that were made and which resulted in the discovery of the process. It was found that a mixture of cyanide of potash and sulphur, particularly when moist, had the effect of removing the iron and leaving the zinc unchanged. The cyanide of potash, however, was found to be too expensive for the refining of a cheap metal like zinc, so that leather was substituted for it. It is well known that leather is used in making cyanides, and for this reason, it was substituted for the cyanide with good results. Just what the action of the combination is, it is difficult to say, but the fact remains that it does the work. The sulphur, undoubtedly, is the principal agent and, combining with the iron, causes it to separate out in the form of matte.

As it seems to be necessary to have steam present in refining the zinc, the inventor of the process used raw potatoes as the source of it. At first the use of such material as potatoes in refining metals would seem ridiculous, but upon second thought one realizes that its only action is to furnish steam. Green wood is used in copper refining, and in reclaiming thick tin or lead. Bones are also a favorite material among soft metal workers for refining lead and tin alloys. In any case, whether wood, potatoes or bones, the effect is the same—the generation of gases in the metal. Potatoes were used by Joseph Richards, and herewith is given his method for carrying out the refining process.

The zinc-dross is melted in a kettle, and a mixture of raw potatoes, sulphur and leather scraps are introduced into it. A good heat, of course, is required, and in order to work well, it must be rather fluid. The introduction of the mixture of potatoes, sulphur and leather is performed by a phosphorizer made of crucible material. This is a bell-shaped affair containing a pocket on the interior, in which the mixture may be placed. The quantity that is introduced should be small, as a large quantity will cause the zinc to boil too rapidly. What is needed is a rather strong ebullition. It is well, therefore, to introduce several portions, so that as soon as one is exhausted, the other can be used. In this manner the zinc is kept in constant ebullition, but not so that it boils over the kettle. The complete refining takes from fifteen minutes to half an hour. The dross rises to the top, and may be skimmed off, but the iron forms a sulphide matte, and settles down to the bottom. The zinc is now drawn off.

It is apparent that the zinc is also filled with oxide, which deteriorates in quality. The agitation to which it was subjected in refining, as well as in the galvanizing kettle, introduce oxide, and unless this is removed, the zinc is not good. It is customary to do this by means of aluminum. A very small quantity of aluminum is needed, however, and it is customary to add the equivalent of 0.001 per cent. It has been found that this is all that is required to thoroughly remove the oxygen. The weighing of such a small amount of aluminum is beyond the scrap metal industry, and even were it done, it would be almost microscopic, and difficult to introduce. For this reason it is customary to make an alloy of zinc and aluminum containing a small amount of aluminum, and add this to the zinc. The mixture that is used for this purpose consists of the following:

Zinc	95 pounds
Aluminum	5 pounds

These are melted together, and poured into ingots, which are cut up into small pieces for use. A half pound of this alloy is added to each ton of zinc after it has been refined, and just before pouring and has been drawn off. It is then poured into slabs.

An analysis of spelter made in this manner gave the following results:

Zinc	98.35%
Lead	1.50%
Iron	.15%

It is apparent that this process is quite efficacious in removing the iron, as the above analysis is even better than the majority of common spelters found on the market, and made from ore. The spelter has a fracture, however, that indicates that it is not perfectly pure and while it answers for many requirements of the brass foundry, it is not suited for the best class of work. The slight amount of aluminum that it contains prevents its use for many purposes. It is quite possible that phosphorus would answer the same purpose, and not be open to the same objections as aluminum.—W. J. R., Problem 5,529.

Practical Brass Foundry Digest

By H. M. ST. JOHN

Chief Metallurgist, Detroit Lubricator Company; Associate Editor, METAL INDUSTRY.

Short Abstracts of Articles of Interest to Practical Non-Ferrous Foundrymen and Metallurgists.

Powder Metallurgy. Charles Hardy. Metal Progress, Vol. 29, April, 1936, page 63.

"Powder metallurgy is the art of producing from powders by hot or cold compression a formed product, which upon subsequent heat treatment shows characteristics not generally obtainable by orthodox processes." The article describes in detail the manufacture of such products and their applications. It is particularly applicable to very refractory metals, such as tungsten and molybdenum, mixtures of non-metallics with metals, such as copper and graphite, and mixtures of metals having widely different melting points, such as silver and molybdenum. Synthetic brass has been made by pressing together copper and zinc powders, heat treating and reworking.

Coloring of Metals: Copper and Brass. Herbert R. Simonds and C. B. Young. Iron Age, Vol. 137, April 16, 1936, page 25.

The natural colors of copper and its alloys have long been utilized for decorative purposes. This article gives elaborate diagrams and detailed instructions for the attainment of a great variety of colors by varying the composition of alloys. Colors varying from red to violet may be obtained by electroplating in an alkaline solution of copper lactate. Formulae are also given for many chemical solutions which impart different colors to copper, bronze and brass. Almost any color desired may be obtained by some one of these methods.

Alloys of Copper and Iron. K. M. Simpson and R. T. Banister, Metals & Alloys, Vol. 7, page 88 (April, 1936).

The authors describe an extended investigation of alloys varying from 85 per cent copper, 15 per cent iron, to 85 per cent iron, 15 per cent copper, with special attention to the 50-50 alloy. Intricate castings were successfully produced from this alloy, melted in a high frequency induction furnace in order to avoid contamination. The solidification shrinkage is very large and must be compensated by shrink heads similar in volume to those used for monel. In wrought material electrical conductivity comparable to brass was obtained.

Manufacture of Lead-Bronze Bearings. Kurt Nischk. Metal Industry (London). Vol. 48, page 415 (April 3, 1936). (Translated from Die Giesserei.)

The author describes methods for producing copper-lead alloy bearing linings by (1) casting the coating alloy on the bearing itself and (2) casting the alloy on to a sheet and afterward shaping the composite sheet to form the bearing. In either case liquation of the lead during cooling is the most serious problem. A number of French, British, German and American patents are abstracted and discussed, with diagrams.

The Reduction of Core—Shop Costs. N. P. Newman. Metal Industry (London). Vol. 48, page 417 (April 3, 1936).

An abridgement of a paper presented before the London Branch of the Institute of British Foundryman, dealing particularly with the volume production of cores. It is economical to use a high quality of binder. Except for the special mixture required for machine blowing the foundry should standardize on one sand mixture. As much as 30 per cent reclaimed sand can be used in the mixture. Core wires and tramp iron must be removed by screening or magnetic separation before mixing. Any of various mixers which knead without grinding may be used. For hand work girls are the best core makers. Early difficulties with core-blowing machines have largely been overcome and these, with a daily output of 1,500 to 2,000 cores of moderate size, afford the cheapest method for mass production. Aluminum boxes are recommended as compared with cast iron or wood. For drying, forced draught coke-fired furnaces or producers which supply hot dust-free CO_2 gas are most economical. Continuous ovens, with conveyors, are less flexible than the batch type. Fuel cost figures are given for coke only, although gas, oil and electricity are mentioned.

The Hot-Shortness of Aluminum Alloys. J. Vero. Metal Industry (London). Vol. 48, page 431 (April 10, 1936).

A paper from the Royal Hungarian Palatin Joseph University, describing an investigation of the cracking of aluminum-alloy die castings. Eight alloys were studied. The importance of die design and die temperature is emphasized.

Hot Pressings in Brass and Other Non-Ferrous Metals. J. Willis Beard, Metal Industry (London), Vol. 48, page 438 (April 20, 1936).

From a lecture given to the North East Coast Local Section of the Institute of Metals. Various presses are described and illustrated. Die design, materials and applications are discussed in some detail.

High-Strength Zinc-Base Alloys. A. H. Mundey, Metal Industry (London). Vol. 48, page 443 (April 10, 1936).

A paper given before the Midland Metallurgical Societies. After discussing the history of zinc, some of its properties and the pure state in which it is now available, the author describes the early failures of the die-casting process, principally due to the effect of impurities in promoting deterioration. American researches resulted in the development of alloys and methods which have produced satisfactory results. Properties of various alloys are given.

The Manufacture of High Purity Zinc and High Grade Zinc Die-Casting Alloys. D. S. Burwood. Metal Industry (London), Vol. 48, page 455 (April 17, 1936).

A review of modern practice.

High Strength Aluminum Casting Alloys. Anon. Metal Industry (London), Vol. 48, page 458 (April 17, 1936).

A discussion of heat-treatable alloys, developed for severe duty with particular reference to their physical characteristics and casting properties.

A Brief Study of American Die-Casting Machines. Herbert Chase. Metal Industry (London), Vol. 48, page 481 (April 24, 1936).

A review of various machines with photographs and diagrams.

The Hot-Shortness of Aluminum Alloys. J. Vero. Metal Industry (London), Vol. 48, page 491 (April 24, 1936).

A continuation of article abstracted above. The extent of hot shortness is worked out by mathematical formulae as a basis for the design of metal moulds which offer promise of overcoming this difficulty.

Pressure Die Castings in Brass. Herbert Chase, Iron Age, Vol. 137, 5/7/36, p. 40.

Brass die castings of moderate size can be made with sections 1/16 inch or less in thickness, with dimensional tolerances of plus or minus 0.005 inch per inch, superior in these respects to brass sand castings or forgings but inferior to zinc and aluminum die castings. Superior physical properties and corrosion resistance favor brass. Practice at the Batavia plant of the Doehler Die Casting Co. is described. As many as 50,000 casts have been made in an 8-cavity die before replacement became necessary. Various alloys are used, all containing high percentages of zinc, with various proportions of tin, silicon, aluminum, nickel and manganese.

Modern Equipment

New and Useful Devices, Metals, Machinery and Supplies.

Zinc Bonderizing Process

The Parker Rust-Proof Company, Detroit, Mich., have made the announcement of a new process called Bonderite "Z." This latest Parker process is said to prevent corrosion and to stabilize paint finishes on zinc-alloy die-castings and galvanized and galvannealed iron. It is a low-cost, easily applied, chemical conversion process that both coats and alters the surface of the metal.

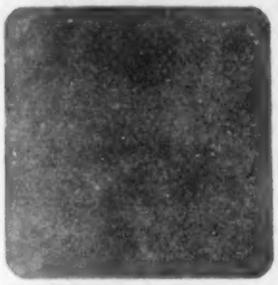


Fig. 1. Left. Plain Zinc Surface Before Bonderizing. Fig. 2. Right. Same Surface After Bonderizing.

How Bonderite "Z" Works

Technically, Bonderite "Z" is a chemical conversion process. It is stated that the process converts the metal's smooth surface into an absorbent, paint-holding, crystalline structure and produces an insoluble phosphate salt coating that becomes an integral part of the metal itself. Bonderite "Z" is recommended for application to zinc-alloy die-castings, stampings, forgings, and rolled or machined parts and galvanized or galvannealed parts of any size or shape. Its effectiveness is best demonstrated on parts having recesses, depressions or internal threads where it contacts all surfaces equally, converts the metal, and deposits its protective coating in every crevice and corner. Because it is a chemical conversion process, and because it is applied at comparatively low temperatures, Bonderite "Z," it is claimed, does not change the size, shape or contour, nor distort or warp the production treated. Like Bonderite "B" and "Z," and its other related processes Bonderite "Z," requires comparatively simple equipment, is easily applied, and is inexpensive. It requires no electric current. Besides ordinary cleaning and rinsing tanks, the only other equipment needed is a processing tank of sufficient size—and trays, baskets or hooks in sufficient quantity—to handle the daily production requirements.

Bonderite "Z" application is said to require no expert supervision. Parts to be treated are simply cleaned, immersed in the processing tank one-half to three minutes, removed, rinsed and dried. It comes in concentrated liquid form which requires only the addition of water to prepare the working solution. A simple titration indicates the concentration of the processing solution which can easily be kept at the proper working strength by the addition of the concentrated Bonderite "Z" chemical.

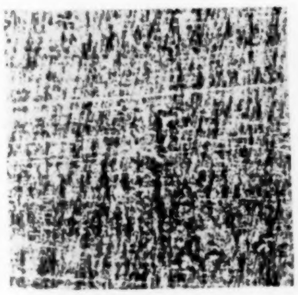
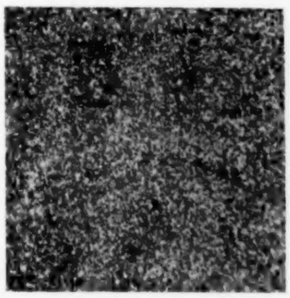


Fig. 3. Left. Zinc Surface (X30) Before Bonderizing. Fig. 4. Right. Same Surface (X30) After Bonderizing.



The entire process, including chemicals, labor, and write-offs on equipment, it is claimed, adds but a fraction to the total cost of any product.

Tests to Prove Effectiveness of Bonderizing

The accompanying photographs illustrate tests on surfaces treated with Bonderite "Z." Figs. 1 and 2 show the change that comes over zinc when it is Bonderized. Fig. 1 is untreated. Its surface is smooth, non-absorbent. It affords no adequate foothold for paint. It has no coating to guard against corrosion or to neutralize chemical action between the paint and the zinc. Fig. 2 has been Bonderized. An insoluble phosphate coating has formed on the surface. Because this coating consists of millions of minute crystals, it provides a foundation for paint. Paint flows into the spaces between the crystals and when it hardens, securely anchors itself in place.

Figs. 3 and 4 show the same two samples as Figs. 1 and 2 except they are enlarged 30 times thus defining more clearly the change that Bonderite "Z" produces.

Figs. 5 and 6 show two pieces of zinc that were finished with three coats of lacquer, scratched and subjected to a salt spray for 500 hours. As can be noted, the finish on the Bonderized piece (Fig. 5) came through the severe test practically intact, but the finish on the untreated piece (Fig. 6) has obviously broken down.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Samples and Specimen Case; made of aluminum and plastics. Chemical Publishing Co. of N. Y., Inc., 148 Lafayette St., N. Y.

Pedestal Motor Drive; 9" workshop lathe. South Bend Lathe Works, South Bend, Ind.

A Better Current Transformer; 9 ranges; portable, metal case. The Esterline-Angus Co., Indianapolis, Ind.

Renewable Type Fuse Plug. "Perma-Fuse." Designed to end replacement expenses and inconvenience. Perma-Fuse Corp., Louisville, Ky.

Quick-Lok Nut; easy application. Philip Carey Co., 400 N. Michigan Ave., Chicago, Ill.

Low-Range Pressure Recorders and Controllers. Model D40M series. Bristol Co., Waterbury, Conn.

Fig. 5. Left. Zinc Panel, Bonderized and Sprayed with 3-Coat Lacquer System; Good After 500 Hours in Salt Spray

Fig. 6. Right. Same Panel, But Painted Without Bonderizing; Broken Down

New Process Available to All Manufacturers

Like the other Parker processes, Bonderite "Z" licenses will be awarded to manufacturers who wish to set up their own processing equipment; and complete Bonderite "Z" service will be available to small manufacturers and occasional users at the twenty-two Parker Jobbing Service Plants dotting the country from Boston to San Francisco.

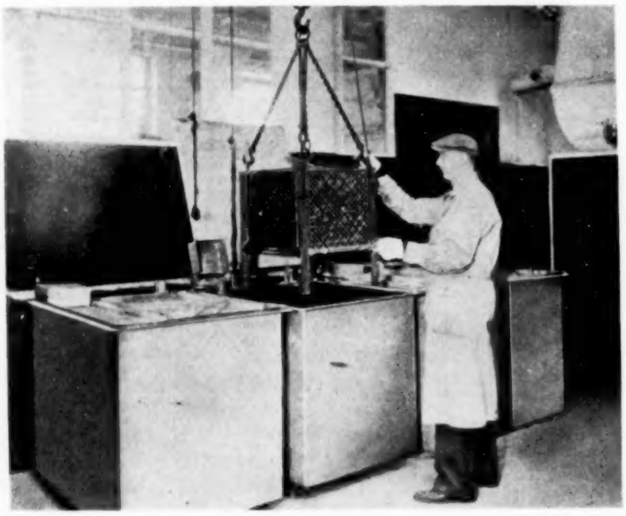
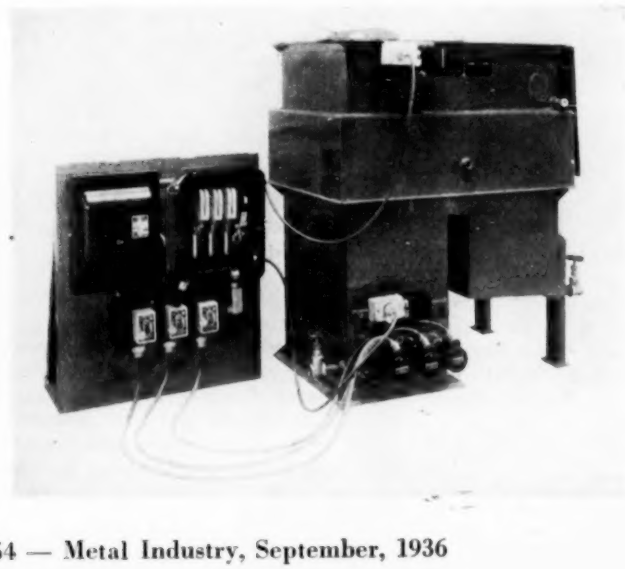


Fig. 7. Bonderizing Installation

Solvent Degreasing Machine

A new two-dip solvent degreasing machine, designated as size 624, has recently been added to the line of Detrex Degreasers manufacturd by Detroit Rex Products Company, 13005 Hillview Avenue, Detroit, Michigan.

Among the important features of this machine are a water jacket type of condenser completely encircling the machine, and a solvent collecting trough located directly beneath the condenser. By this arrangement of the condenser and condensate collecting trough, the solvent vapors are held within the machine and all of the pure solvent distillate is emptied directly into the second or rinse chamber, thus renewing the rinse chamber with pure solvent.



Rex No. 624 Degreaser

With this type of degreasing machine, the work is usually handled manually in baskets or on racks. For convenience, especially when comparatively heavy loads are cleaned, a small hoist may be employed.

This machine is used for both immersion and vapor cleaning. The usual sequence of operations is to immerse the work in the boiling chamber, cool it in the clean solvent rinse, and finally suspend it for a few seconds in the pure solvent vapors over the boiling chamber. The work is removed clean and dry. This complete cycle of cleaning operations is accomplished in less than a minute and yet every trace of oil and grease is removed.

Either "Perm-A-Clor" or "Triad," stabilized chlorinated solvent is used in Detrex Degreasers. These solvents are non-inflammable and non-explosive and have a solubility factor for oils and greases more than four times that of ordinary organic solvents. The solvents are used over and over with but slight maintenance.

The contamination resulting from the cleaning operation is removed from the solvent by periodic distillation within the machine. To facilitate this cleaning operation, there is an outlet from the solvent trough at one end.

The unit shown in the illustration is arranged for electric heating, using three immersion type heaters. It is equipped with both top and bottom thermostats (expanded metal guard has been removed from top thermostat to show construction). The relay and switch equipment can either be placed on side of degreaser or mounted on a separate panel as shown.

These Detrex Degreasers are also designed for steam or gas heating.

Acid Handling Equipment

Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y. are manufacturers of safety equipment for handling carboys containing acids and other corrosive chemicals. Their carboy truck is self-loading (by one man) and will fit any size carboy. The illustration shows the construction clearly.

Carboy Truck

The Pulmosan geared carboy tilter is an all steel pouring machine with parts welded. The carboy is automatically locked in place on the tilter after being placed there with the aid of the carboy

truck. The carboy may then be turned bottom side up, if necessary, so that the last drop may be drained without

Carboy Tilter

danger of splashing, staining the floors or injuring the operator.

Enamel Stands Chrome Plating and Buffing

Baflex Enamel made by the Roxalin Flexible Lacquer Company, Elizabeth, N. J., is said by the manufacturers to be so tough that it actually stands a chrome plate bath, so hard that it can be buffed to a glass-smooth high lustre without drag.

This finishing product was developed especially for the metal novelty industry. On such products as brush-backs, etched name plates, compacts, vanity cases, cigarette cases, it can be applied directly on the bare metal.

It air dries dust free in regular lacquer time, but to give Baflex its unusual durability, a bake of 275° F. for one hour is required. Even when several coats are applied, however, only one bake of this enamel is necessary. Highlights can then be chrome plated and then buffed clean without drag.

Baflex Enamel can be supplied in all colors, and can be applied by spraying.

Plating Solution Control

It is announced by the Grasselli Chemical Company, Cleveland, Ohio, that it is in a position to offer the trade test kits for the control of cadmium and zinc plating solutions. Three kits have been developed for this purpose:

For the determination of cadmium in cadmium-cyanide plating solutions.

For the determination of zinc in alkali-cyanide or acid-zinc plating solutions.

For the determination of the total sodium-cyanide content in zinc or cadmium plating solutions.

As nearly all previous methods of determining these constituents were either inaccurate, unreliable or intolerably slow, the company sought to develop a method that would be accurate, reliable and quick means of finding the concentration of these constituents in the plating bath.

It is stated that these test sets are easy to manipulate. In organizations where centralized laboratory control is available it has been ascertained that the plater finds these test kits of great value, especially when the information they can give is required in a brief period of time.

These test sets for solution control supplement the Hull and Strausser test sets announced by Grasselli a few months ago for determining the thickness of electrodeposited cadmium or zinc coatings.

There is an increasing demand for coatings of specified thickness. These developments make it convenient for the plater to determine the composition of his plating bath and in that way keep it in the most efficient condition, enabling him to apply the specified coating thickness of cadmium or zinc in the minimum plating time.

Protective Foundry Coating

Firit is a protective foundry coating for heat resisting parts used in foundries, die casting plants, heat treating furnaces, etc., which is made by Foundry Services, Inc., 107 E. 41st Street, New York. Firit is used to coat the heat resisting parts made of either metal or refractory materials. It will withstand temperatures up to 3600° F.

The material is shipped dry, requiring the addition of water for mixing. This mixture is then painted on all parts exposed to the action of heat or molten metals. Firit is recommended for coating crucibles, iron melting pots, ladles and spouts, furnace walls, linings and muffles, etc., plungers, skimmers, tongs, etc.

New Enamels to Protect Iron and Steel from Corrosion

A new line of air-drying enamels, especially designed to prevent the corrosion of iron and steel in railroad, marine, mining, oil, and general industrial service, has been developed by Maas & Waldstein Co., makers of lacquers and lacquer enamels, Newark, New Jersey.

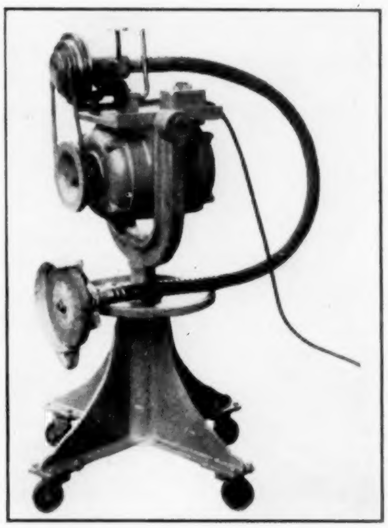
These new anti-corrosive enamels are made of rust inhibiting pigments and a synthetic resin vehicle, and form a hard, tough coating that is said to be resistant to wear and of pleasing appearance. Exposure tests, conducted for a long period of time, it is stated, show that they are particularly effective in providing protection from the corrosive action of humidity, salt water, alkali, and a variety of chemicals, and in preventing electrolytic action, according to the manufacturer.

A single coat gives adequate protection where the exposure is not prolonged or severe, but for maximum protection two coats are recommended.

These new enamels can be applied by either brush or spray. They air-dry in four hours and are hard overnight. Types for baking for one hour at 250 to 350 degrees F. can also be supplied. They cover approximately 350 feet per thinned gallon. Available colors are brown, black, red, and a bronze liquid, which serves as a vehicle for aluminum and other metallic powders.

New Flexible Shafting

A new flexible shaft assembly has been devised by the Stow Manufacturing Co., Inc., Binghamton, N. Y. This machine was developed as a general purpose tool for grinding, polishing,



Stow Flexible Shaft Assembly

scratch-brushing, rotary filing, buffing and various other operations. Swiveled in both the vertical and horizontal plane, the motor takes its natural position as the flexible shaft is used, thus it is stated, increasing the life of the flexible shaft by eliminating sharp bends at the motor end. Four speeds are available with quick belt release for changing from one speed to the other.

"Invisible Ray" Welding

A tremendous stir was recently created in the daily press by the annoucement of a Dr. Anton Longoria, of a new welding process applicable to non-ferrous as well as ferrous metals, by which thin sheets can be butt welded together by an "invisible ray", which joins the sheets, not by fusion but by "breaking down the molecular attraction" at the edges of the abutting pieces; this breaking down occurring at less than 700 deg. F. The reports also included statements of payments of sums ranging from $800,000 to $6,000,000 for the patent rights.

At this time no conclusive reports are available, but current opinion seems to be that the process has merit although there is no indication that it is "revolutionary."

Butt welds have been made of thin gauge sheet and although they are not all perfect, the indications are that with the development of the proper production equipment, this process should become commercial.

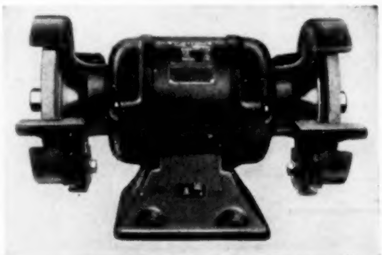
No authentic details are available about the "invisible ray" which, it is said, is high frequency electrical energy of about 2KW, between 1,000,000 and 2,000,000 cycles.

New Bench Grinder

A powerful, smooth-running and noiseless bench grinder is said to be that presented by the Thor line of electric tools of the Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Ill. The Thor BG66 6" bench grinder is particularly fitted for factory and garage work such as general grinding, polishing, and buffing work, removing burrs, sharpening tools and wire brush applications. This model, it is stated, includes all of the newer improvements in bench grinder construction to assure safe, efficient and long time operation. It is said to be unusually free from vibration, runs smoothly and practically noiselessly.

Ball bearing construction throughout; precision, balance, completely enclosed motor which eliminates operating difficulties due to oil and dust trouble; tool rests which can be adjusted to various positions; heavy special wheel guard furnished for either alternating or direct current.

One of the outstanding features claimed for this bench grinder is the cut-out switch. A collector ring is in contact with the carbon brushes just at the stop and start positions. The collector ring has a wiping action to eliminate pitting.



Thor BG66 Bench Grinder

Magnetic Pulley

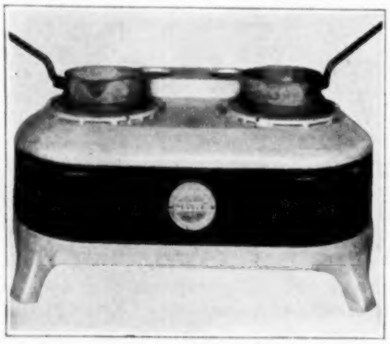
The Dings Magnetic Separator Company, Milwaukee, Wis., is offering a new design of magnetic pulley which has a 50% greater radiating surface than other structures heretofore supplied. The horizontal and radial ducts for air currents are corrugated or ribbed like the surface of an air cooled gas engine cylinder.

The conveyor belt forces the air downward through the radial openings and out through the longitudinal ducts, both corrugated, and therefore presents the maximum amount of radiating surface. Heat generated in the coils is quickly conducted from them through the high conductive dynamo steel poles and cores and dissipated.

Magnetic Pulleys with corrugated air passages under actual operating conditions have been proved to have an excess of 20% greater magnetic pull than either the solid pulley or those not having corrugated openings. Dings catalogue No. 25 just from the press, gives many facts and figures about the new design of pulley. It also illustrates many other types of magnetic equipment.

Aluminum Melting Furnace

A completely new design has been embodied in the Master aluminum melting furnace, manufactured by the Kindt-Collins Co., 12697 Elmwood Ave., Cleveland, Ohio. A new gas and air regulator with semi-automatic motor control has been included. This control is operated simply by moving a hand level along an indicator scale. The power switch is automatically turned on and off at the proper time. The



Master Aluminum Melting Furnace

usual adjusting of valves is said to be entirely eliminated, and also that any kind of a flame from a soft mild heat to a blasting high heat can be produced instantly by means of a control lever.

A preheater utilizing waste heat is said to reduce melting time and step up production. Among the advantages claimed for this furnace are: simplicity and accessibility; low fuel consumption; short melting time; prevention of absorption of gases by the molten metal; metal poured directly from the melting pot into the mold.

Special Metal Finishes

A new type of metal finish for machinery and industrial applications is being manufactured by the Asphalt Products Co. Inc., Eastwood Station, Syracuse, N. Y. These finishes, with an asphalt base, cannot be called paint, lacquer, varnish or enamel, but, it is claimed, they combine the good feature of all four. The following advantages are given:

Wide color range—gray, brown, green and red as well as black.

Attractive lustre.

Hard surface combined with sufficient resiliency to prevent cracking, checking or peeling.

Durability—insoluble in oils and distillates of petroleum, etc.

The finishes are said to be strongly resistant to the action of alkali and most acids, chemical fumes, moisture, smoke, etc., and will stand temperatures up to 400 degrees F. without deterioration.

Rubber and Bitumen

A combination of rubber and bitumen from which the sulphur has been removed by artificial oxidation, and appropriate solvents with other ingredients added to make it dry rapidly and form a glossy surface when dry, has been named Rubalt R A by the manufacturers, Alfred Hague and Co., Inc., 233 37th St., Brooklyn, N. Y. The characteristics claimed for this material are non-porosity, flexibility, rust prevention, self-healing, acid and alkali resistance, no flow under heat, resistance to dry heat up to 400 degrees F., no primer required, coverage 700 sq. ft. to the gallon, unaffected by sudden and extreme temperature changes, non-toxic, light in weight and extraordinarily waterproof.

Rubalt R A can be applied without the use of heat by brushing, dipping or spraying.

Acid Proof Cement

Sauer-Eisen Cement No. 31, made by the Sauereisen Cements Co., Sharpsburg, Pa., is a sodium silicate cement which is quick setting and self-hardening, due to the chemical reaction of the ingredients of the mortar. The cement is shipped in combination form of powder and liquid binder.

Sauer-Eisen Cement No. 31 hardens by setting (not drying), the initial set taking place within approximately one hour, while the final set occurs in 24 to 36 hours, when the tank can be used.

Sauer-Eisen Cement No. 31 has a tensile strength of 365 lbs. per square inch. If 50% Silica Sand is added, the tensile strength is increased to 400 lbs. per square inch.

Bolts, Nuts, Screws, Washers and Accessories, of brass, bronze, Everdue, Monel and stainless steel. H. M. Harper Co., 2620 Fletcher St., Chicago, Ill.

Dipping Baskets. Technical information on the various alloys and their resistance to corrosion under given conditions. The C. O. Jelliff Mfg. Corp., Southport, Conn.

Simplified Analysis Handbook—1936 edition. Simple methods of analyzing plating solutions. Gives procedures for analyzing all standard plating baths, using proprietary standard solutions for analysis. It is expressed in non-technical terms so that the plater with no technical training can perform the necessary analyses. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Mirror "54" Cleaner—to remove oil and grease prior to plating and enameling; also Plater's Compound for cleaning before plating, nickel, copper, chromium, brass die castings, etc.

Totalling Enclosed Fan Cooled Motors. Engineering pointers on the application, selection and installation. Lincoln Electric Co., Cleveland, Ohio.

Pyrometric Heat Control. Detailed analysis of the recently developed "radio principle." Wheelco Instruments Co., 1112 Milwaukee Ave., Chicago, Ill.

Rubber Gloves, Aprons, Boots, Hard Rubber Buckets, Pitchers, Dippers, Dipping Baskets, Protective Apparel and Safety Devices. Trade Catalog 836. Miller Products Co., 7-9 W. 30th St., N. Y. City.

Manual Motor-Starting Switches. CR1062. Full voltage type A-C and D-C. General Electric Co., Schenectady, N. Y.

General Purpose Squirrel-Cage Induction Motors. Type K; fractional horsepower. General Electric Co., Schenectady, N. Y.

Pyranol Capacitors for Every Application, to improve power factor. General Electric Co., Schenectady, N. Y.

Barriers to Industrial Waste. A booklet on installation for all types of heated or refrigerated equipment; also on Rock Cork pipe covering for low temperature piping. Johns-Manville Corp., 22 E. 40th St., N. Y. City.

Vacuum Cleaning Systems to reduce hazards due to injurious dust. Spencer Turbine Co., Hartford, Conn.

Industrial Spray-Finishing Equipment. Catalog "IB." Information on spray guns, air compressors, air and fluid hose, exhaust systems, spray booths, exhaust fans, etc. DeVilbiss Co. Toledo, Ohio.

New Product Summaries on Flexible Finishes. The first series of concise, attractively designed product summaries of flexible finishing materials engineered by the Roxalin Flexible Lacquer Company, Elizabeth, New Jersey. These bulletins contain descriptions of Blax and Leaflex Aluminum, both one-coat, air-dry, no-primer finishing materials; also Ba-Flex, the flexible enamel to withstand chromium plating solution and require only one bake even though several coats are applied. Blue Knight Taupe No. 978A is the last product summary included in this series. This particular coating is neutral in color and corresponds to an oxidized electroplated finish, so that it does not show dust, finger-marks or metal imperfections. A simple arrangement saves the time of the reader. The main folder has a pocket in which the product summaries of specific interest can be inserted and the folder includes a list of the literature enclosed. All are profusely illustrated, and contain finished metal strips so that a desk-top demonstration of their flexibility and adhesion can be performed by twisting, bending, and finger-nailing. Product summaries on other Roxalin flexible finishes are being prepared and will appear regularly during the next few months.

Associations and Societies

National Metals Week

A. I. M. E. Metals Divisions' Meetings

The Institute of Metal Division and the Iron and Steel Division of the A. I. M. E. will hold individual technical sessions and a Joint Round-Table Discussion as a part of the program of National Metals Week in Cleveland during the week of October 19th.

Headquarters of the A. I. M. E. division will be at the Statler Hotel. Registration will begin Monday, October 19th and the technical sessions will open Tuesday morning, October 20th and continue to and include October 22nd. All the technical sessions, except those on Wednesday afternoon, will be held at the hotel headquarters. The Wednesday afternoon sessions of both divisions will be at the Cleveland Exposition Auditorium.

On Thursday, both the morning and afternoon sessions will be joint sessions of the two divisions for the presentation of a Round-Table Discussion on "Physical Tests of Metals and Their Significance."

Technical meetings of the Institute of Metals Division will include sessions on Aging of Metals, Constitution of Alloy Systems, and a session on General Non-Ferrous Metallurgy. The Iron and Steel Division has scheduled sessions on Blast Furnace Operation, Open Hearth Steel Problems, and on X-Ray Metallography. The Joint Round-Table Discussion sponsored by both divisions will include papers on stress-strain relations, the yield-tensile ratio, Poisson's ratio and ductility factors, fatigue, the transverse notch bar test, tension impact testing, and the relation of hardness to wear and seizure.

The Joint Dinner of the two Metals Divisions will be held on Wednesday evening, October 21st.

General and Non-Ferrous Technical Sessions of the American Soeiety for Metals

Monday Morning, Oct. 19
Statler Hotel

Cadmium Alloys for Bearings, by C. F. Smart

Diffusion of Hydrogen through Nickel and Iron, by W. R. Ham

Monday Afternoon—Public Auditorium

Lecture on Physical Testing of Metals by H. D. Churchill

8:00 P. M.—Public Auditorium

Lecture on X-Ray Analysis, K. R. VanHorn.

Tuesday Morning, Oct. 20
Statler Hotel

The Effect of Titanium on Some Cast Ferrous and Nonferrous Metals by J. A. Duma

4:30 P. M.—Public Auditorium

Lecture on Physical Testing of Metals by H. D. Churchill

8:00 P. M.—Public Auditorium

Lecture on X-Ray Analysis by K. R. VanHorn.

Wednesday Morning, Oct. 21

Annual Meeting and Campbell Lecture

4:30 P. M.—Public Auditorium

Lecture on Physical Testing of Metals by H. D. Churchill

8:00 P. M.—Public Auditorium

Lecture on X-Ray Analysis by K. R. VanHorn.

Thursday Morning, Oct. 22
Statler Hotel

Symposium on the Plastic Working of Metals

X-Ray Study of Preferred Orientations in Pure Cold-Rolled Iron-Nickel Alloys by D. McLachlan, Jr. and W. P. Davey

Application of X-Ray Diffraction to the Study of Fatigue in Metals by C. S. Barrett

X-Ray Diffraction Studies of Distortion in Metals by G. L. Clark and M. M. Beckwith

Thursday Afternnon—Public Auditorium

Symposium on the Plastic Working of Metals

4:30 P. M.—Public Auditorium

Lecture on Physical Testing of Metals by H. D. Churchill

Friday Morning, Oct. 23
Statler Hotel

Symposium on the Plastic Working of Metals

Conversion of Elongation Data from One Form of Test Piece to Any Other by E. J. Janitsky

Friday Afternoon—Public Auditorium

Symposium on the Plastic Working of Metals

Recovery of Cold Worked Nickel at Elevated Temperatures by Erich Fetz

4:30 P. M.—Public Auditorium

Lecture on Physical Testing of Metals by H. D. Churchill

Symposium on the Plastic Working of Metals

To be held on Thursday morning and afternoon, October 22nd, and Friday morning and afternoon, October 23rd.

Laws and Fundamentals of Plastic Deformation by A. V. deForest

Metallic Single Crystals and Plastic Deformation by S. L. Hoyt

Creep Characteristics of Metals at Elevated Temperatures by C. L. Clark and A. E. White

Interpretation and Use of Creep Results by J. J. Kanter

Elastic Properties and Their Relationship Strain Hardening by M. F. Sayre

Effect of the Shape of the Test Piece Upon the Energy Needed to Deform Materials in the Single Blow Drop Test by O. W. Ellis

Hot Working, Cold Working and Re-Crystallization Structure of Metals by N. P. Goss

Factors Relating to the Production of Drop and Hammer Forgings by Adam Steever

Hot Press and Upset Forging by J. H. Friedman

Extrusion of Metals by D. K. Crampton

Damping Characteristics of Metals by G. R. Brophy

American Foundrymen's Association

222 W. Adams Street, Chicago, Ill.

Meetings of the Executive Committee, of the retiring Board of Directors and of the new Board, were held at Hotels Cleveland and Statler, Cleveland, July 22 and 23.

The annual reports of officers and of the Special Committee on Association Policies and Activities were received at the meeting of the 1935-36 Board with **President D. M. Avey** presiding. At the adjournment of the old Board, **President Avey** introduced the incoming president, **James L. Wick, Jr., Vice-president-elect H. Bornstein** and new directors. Following the introduction, the first meeting of the 1936-37 Board of Directors was called to order with President Wick in the Chair. The personnel of the new Board is as follows:

President—James L. Wick, Jr., Falcon Bronze Co., Youngstown, Ohio

Vice-President—H. Bornstein, Deere & Co., Moline, Ill.

Directors—Terms Expiring 1937

E. O. Beardsley, Beardsley & Piper Co., Chicago

E. W. Campion, Bonney-Floyd Co., Columbus, Ohio

W. L. Seelbach, Forest City Foundries Co., Cleveland

Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh

Sam Tour, Lucius Pitkin, Inc., New York

Directors—Terms Expiring 1938

W. J. Cluff, Frederic B. Stevens, Inc., Detroit

C. E. Davis, Alloy Specialty Co., Coraopolis, Pa.

L. S. Peregoy, Sivyer Steel Casting Co., Milwaukee

F. A. Sherman, Dominion Foundries & Steel, Ltd., Hamilton, Ont.

H. S. Washburn, Plainville Casting Co., Plainville, Conn.

Directors—Terms Expiring 1939

James R. Allan, International Harvester Co., Chicago

D. M. Avey, The Foundry, Penton Bldg., Cleveland

Carl C. Gibbs, National Malleable & Steel Castings Co., Cleveland

Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala.

The Board organized by re-electing **C. E. Hoyt, Executive Secretary-Treasurer and Manager of Exhibits; R. E. Kennedy, Technical Secretary; Jennie Reininga, Assistant Secretary-Treasurer; E. O. Jones, Director of the Safety and Hygiene Section** of the Association. A new position, that of **Assistant Technical Secretary** was created and **Norman F. Hindle** was elected to that position. **Mr. Hindle** has been on the staff of the Association for the past two years, engaged first in the preparation of the **Cast Metals Handbook** and later in editorial and technical work.

Directors D. M. Avey, E. O. Beardsley, W. L. Seelbach and **L. S. Peregoy** were elected to serve with the President, Vice-President and Executive Secretary as members of the Executive Committee of the Board.

Following organizations, consideration was given to the recommendations contained in the reports of officers, the Executive Committee and the Special Committee on Association Policies and Activities. This latter committee, of which **Frank J. Lanahan** is chairman, was continued that it might give further consideration to the many written suggestions and proposals offered by present and past Board members.

Acting on the recommendations of the Special Committee and of the retiring Board, the New Board voted unanimously to continue the work of the Safety and Hygiene Section, organized in January, 1936, with **E. O. Jones** as director. With a view of making practices uniform in the several industrial states, all foundrymen, whether members of A.F.A. or not, who have engineering, medical or legislative problems in connection with their safety and hygiene programs are invited to correspond with the director of this section.

A recommendation, presented by the Foundry Sand Research Committee, that the Association support financially a program of research to study the effect of elevated temperatures on molding sand, was received. The Board, considering the importance of this work to the industry and recognizing the great value of the committee's past findings, voted approval of a plan to support this project by raising funds through subscription from firms which have benefited financially from the committee's extensive work on sand control.

Secretary Hoyt, in reporting on invitations received for holding the 1937 and 1938 conventions of the Association commented on the fact that those received from Chicago, Cleveland, Milwaukee and St. Louis were well supported by A.F.A. Chapters in those cities. The Board voted to refer all invitations to the Executive Committee for further consideration as to the time, place and character of the 1937 and 1938 annual meetings, their findings and recommendations to be submitted to the Board of Directors for letter ballot.

A vote of thanks was extended to the members of the Detroit Chapter of A.F.A. for their splendid assistance in staging the 1936 Convention and Exhibit of the Association.

Foundry Conference to Be Held at University of Iowa

The Association announces that an important two-day conference on Foundry Practice will be held at the University of Iowa, Iowa City, Iowa, Friday and Saturday, October 30 and 31. The conference is being sponsored by the College of Engineering of the University, the A.F.A. through its Quad-City Chapter and the Northern Iowa Foundrymen's Association.

The program will consist of sessions on melting practice, sand control and other current foundry problems. Outstanding experts will give the talks and lead the discussions. The detailed program is not ready as yet but will be announced later.

This conference will be similar to the Annual District Conferences held at Michigan State College, East Lansing, Mich., and is one of the several which the A.F.A. is assisting in developing for the purpose of bringing foundrymen together to discuss their mutual problems.

International Foundry Conference

The members of the American Foundrymen's Association are again invited to a World's Congress of Foundrymen. The occasion is the Sixth International Foundry Congress to be held in Dusseldorf in September, the first of its kind to be held in Germany since international exchange of foundry information was established.

You will have opportunity to enjoy this experience with men whose interests are similar to your own. You will meet the leading representatives of the

foundry industry from European countries.

This year, **Vincent Delport,** European representative of the American Foundrymen's Association, is the Vice President of the International Committee of Foundry Technical Associations.

The International Relations Committee of the A.F.A. under the Chairmanship of **Frank G. Steinebach** with **G. H. Clamer, Fred Erb, R. S. MacPherran, V. E. Minich, S. W. Utley,** and **Mr. Delport** are now arranging itineraries in conjunction with **Thos. Cook & Son** who had sufficient experience with the membership of the A.F.A. in 1923 and 1929 when we were the guests of overseas foundrymen to know what is necessary to assure us comfort, convenience and satisfaction.

J. Erler of the Farrel-Birmingham Co. will prepare the American exchange paper.

It is hoped that the members who can avail themselves of this opportunity will make prompt reservations.

JAMES L. WICK, JR.
President.

Boston Branch, A.E.S.

c/o A. W. Garrett, 100 King St., Dorchester, Mass.

The Boston Branch of the American Electro-Platers' Society held its first annual outing Saturday, July 25th at the Pemberton Inn, Hull, Mass.

One hundred and seventy-five men, women and children enjoyed a day of sunshine, sports, fun and a very fine dinner. The members and their families turned out in force and also the supply houses. They were well represented with our old friend **Bob Leather** taking pictures of the officers and all the events. Many thanks to you Bob!

We also had with us our Executive Secretary Kennedy. He gave a short talk on what was expected of all the Branches in helping to get advertisements for The Monthly Review, asking each member to try and get an ad. He also congratulated the branch on the fine work it has done in the past six months.

Boston Branch wishes to thank all who so kindly donated the fine prizes to make the outing a grand success; also the many visitors who came a long distance to be with us. We feel it an honor to have such staunch friends. We as a branch of the A.E.S. feel we want to reciprocate in any way, to our many friends should the occasion arise. Also we owe thanks to the many visitors who came a long distance: **John Oberender** and party from New Haven, Conn.; **Bill Chase** and **Bill Brown** from New York; **Bob Leather** and wife from Waterbury, Conn.; **Oliver J. Sizelove** and wife from Newark, N. J.; **Frank Clark** and **W. J. R. Kennedy,** Executive-Secretary of the A.E.S., of Springfield, Mass.; **R. T. Marshall** and family of Worcester, Mass.; **Mr. & Mrs. Hughes** of the Oakite Co.; **A. Braun** from Bridgeport, Conn., and many others. Thanks to them all.

Louis **Gale** was the umpire of the ball game and was he nervous. His wife showed him who is the boss now by winning the spike driving contest.

Harry Lack was out when he was in (so he says). **Andy Garrett** and **Charley Hardy** looked like a couple of gypsies in their tent. They drank a whole case of orangeade, pencil in one hand and the tonic in the other. They did a fine job on the registration.

Charley Campbell certainly was behind this outing, and he wants it known that he's not an old timer. How about that, Charley?

The Campbell family certainly showed that they are there as athletes in the sports.

The **Baker** family were well represented and also showed that they are athletes.

Ed DeLorme certainly kept the record of the sports events and not one argument.

Bert Sage took care of the advertising and correspondence and did he do a great job well? The prizes can answer that question. Well done good and faithful servant, Bert!

Bill Cahill gave out of gas near the finish of the fat man's race letting **Mr. Braun** in by a stomach. What happened, Bill?

The kiddies had a fine time hunting for the pennies in the sawdust. Did they have fun! Ask **Harry Lack.** He knows.

Other prizes won were as follows—**Charles Foley, Mrs. Louis A. Gale, Mrs. Bob Leather, P. Furlong, J. E. Grant, James Campbell, G. Campbell, Ed. Nevins, A. A. Brunell, Mrs. Bert Sage, Ed. Foster, B. Sage** and **William Lawrence.**

The Committee was composed of the following: **Arrangements, Arthur J. Mintie, Charles F. Campbell, Roy Roscoe, Harry J. Lack, Charles O. Hardy, Edward C. DeLorme, Louis A. Gale,** and **Andrew W. Garrett.**

Advertising—Bert Sage.

Tickets—A. W. Garrett.

Sports—Arthur J. Mintie, Charles O. Hardy, Edward C. DeLorme, Harry J. Lack and **Roy Roscoe.**

The Committee as a whole, hope every one had an enjoyable time. Thanks to you all until we meet again.

A. W. GARRETT, Sec'y.

International Acetylene Association

30 E. 42nd St., New York

The International Acetylene Association will hold its Thirty-Seventh Annual Convention in St. Louis at the Jefferson Hotel, November 18, 19 and 20. This will be the first time that the convention has been held in St. Louis.

Technical sessions will be held each afternoon and on two evenings. The oxy-acetylene process for welding and cutting metals will be featured at these sessions. As the result of a year of unusual developments, a series of vitally interesting subjects will be discussed by speakers who are key men in their fields.

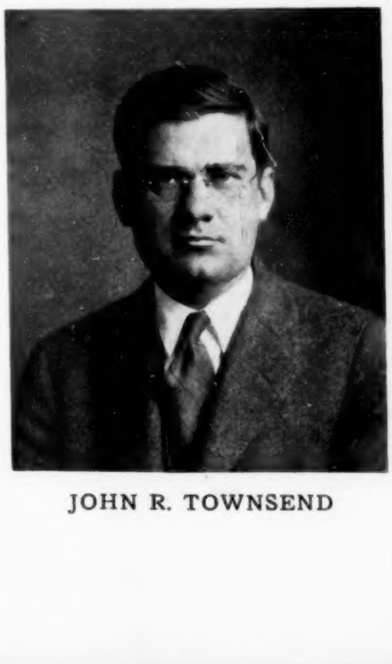
Wednesday evening, November 18, is to be devoted to a forum on welding and cutting. The evening session Thursday, November 19, is intended to comprise a series of popular round-table discussions on oxy-acetylene welding and cutting practices.

A cordial invitation to attend this Convention is extended to everyone interested in the practical applications of the oxy-acetylene process.

Personals

John R. Townsend

John R. Townsend of the Bell Telephone Laboratories, 463 West St., N. Y. is one of the active members of the American Society for Testing Materials. At present, Materials Standards Engineer, Mr. Townsend has been largely concerned with the development of testing methods for metals and the engineering of metallic materials. He is the author of the following papers on metallic materials:



JOHN R. TOWNSEND

"Fatigue Studies of Telephone Cable Sheath Alloy" Proceedings, A. S. T. M., 1927.

"Fatigue Studies of Non-Ferrous Sheet Metal" with C. H. Greenall, Proceedings A. S. T. M., 1929.

"Engineering Materials" in The Iron Age, August 22, 1929.

"Telephone Apparatus Springs"—A. S. M. E. Proceedings, 1929.

"Planning for the Collection of Standardization Data" Proceedings, A. S. T. M., 1933.

Other A S. T. M. Committees (than B-6 on Die-Cast Metals and Alloys of which Mr Townsend is chairman) in the work of which he is active include B-2 on Non-Ferrous Metals and Alloys, Research Committee on Fatigue of Metals, Committee A-10 on Iron-Chromium, Iron Chromium-Nickel and Related Alloys. He is also active in the work of Committee E-1 on Methods of Testing, serving as chairman of the Section on Indentation Hardness.

Herbert N. Forsberg, who has been identified for many years with the **Geuder, Paeschke & Frey Co.**, Milwaukee, Wis., has been appointed sales manager of the contract manufacturing division, succeeding the late **Louis Reinhard**.

Federated Metals Corp., 120 Broadway, N. Y., announces that **W. G. Weber**, salesman in the ingot division, is no longer connected with the company.

F. E. Dunlap has been appointed branch manager of **Stephens-Adamson Mfg. Co.**, Aurora, Ill., in charge of conveyor sales and engineering for the state of Michigan with offices in the Book Tower, Detroit. Mr. Dunlap has had wide experience in conveyor design and has specialized in the sand handling, foundry and automotive end of the business since 1919.

Elmer A. Schneider, formerly owner of the **Mishawaka Pyrometer Instrument Company** is now production manager for **Wheelco Instruments Company**, 1112 Milwaukee Avenue, Chicago, Ill. Mr. Schneider was formerly with Leeds and Northrup, and later with the Brown Instrument Co. and the Pyrometric Division of the Republic Flow Meter Co.

George W. Keller, formerly vice-president of the **Brown Instrument Company**, is now in charge of the Eastern Sales Division of the **Wheelco Instruments Company**, 1112 Milwaukee Ave., Chicago, Ill., manufacturers of pyrometric heat control devices.

Thomas Cruthers has been appointed Vice-President of the **Worthington Pump and Machinery Corporation**, Harrison, N. J. Mr. Cruthers' connection with Worthington dates from 1907. Graduated from Stevens Institute of Technology, where he received the degree of Mechanical Engineer, he first entered the employ of the Westinghouse Machine Corporation, during which connection he served as superintendent of gas engine erecting. In 1907, in the same capacity, he entered the service of the Snow Steam Pump Works, a Worthington subsidiary at Buffalo, New York. Transferred to the Worthington Sales Department in 1908, his first assignment was to the Pittsburgh District Office territory, and subsequently to various others of the Corporation's district offices until 1927, when he was appointed New York District Sales Manager. In 1930 he was appointed Assistant General Sales Manager, and two years later was appointed Assistant Vice-President in Charge of Sales. Mr. Cruthers will direct the Corporation's sales activities with large Steam Power Stations, the railroads, waterworks, sewage, drainage and irrigation projects. He will also have charge of general traffic department.

W. J. Hermes has been appointed representative for the Dumore Co., Racine, Wisc., builder of precision grinders, tools and universal motors, in the metropolitan New York area. Mr. Hermes is located at 100 Varick St., New York.

R. R. LaPelle has become associated with the **Salem Engineering Co.**, Salem, Ohio. Mr. LaPelle was formerly associated with the Electric Furnace Co., as sales engineer and was more recently section engineer in charge of furnace design for the Westinghouse Electric & Mfg. Co. The Salem company manufactures electric, oil and gas fired industrial furnaces for annealing, heat treating, etc.

Clyde E. Williams, Director, **Battelle Memorial Institute**, Columbus, Ohio, has announced the appointment of four Research Associates at that Institute for 1936-37. The Research Associate plan, which is designed to supplement the work of the Institute in fundamental research, is new this year. It is expected that a number of additional Associates will be available in the future. **Dr. Alfred Clark**, University of Illinois, 1935, has been assigned a research project dealing with fundamental problems in chemistry; **Dr. John E. Dorn**, University of Minnesota, 1936, in metallurgy; **Robert P. Graham**, University of Washington, 1936, in ceramics and **Dr. L. G. Turnbull**, University of Toronto, 1936, in industrial physics.

Fred M. Ritts, formerly manager of the St. Louis branch office of the Building Materials Division of the Armstrong Cork Products Company, has been transferred to the executive offices of the company in Lancaster, Pa., where he will serve as manager of the High Temperature Insulation Department of the company. Armstrong manufactures three types of insulating brick and two types of insulating firebrick, and Mr. Ritts will be responsible for directing the sale of these products. **C. W. Robinson**, formerly of the company's Chicago office, will succeed Mr. Ritts as manager of the St. Louis branch office. **E. S. Penn**, formerly of the Pittsburgh office, will take over the responsibilities of Armstrong's office at Albany, N. Y. **R. H. Craig** has been transferred from Lancaster to the Armstrong branch office at Louisville.

Willard F. Greenwald has severed his connections with Weisberg & Greenwald, Inc., and is devoting all his time to Philip Morris & Company, 119 5th Ave., New York with whom he is serving in the capacity of Research Director.

Obituaries

Walter E. Wallace

Walter E. Wallace, aged 44, until recently vice-president of Metal Auto Parts Co., Indianapolis, Ind., died July 5th. Mr. Wallace was one of the founders of the company.

H. C. Phillips

H. C. Phillips, 78, president of H. O. Phillips Co., Pawtucket, R. I., wire and metal specialties manufacturer, died July 13.

Mary Hegeler Carus

Mary Hegeler Carus, 76, president of Matthiessen & Hegeler Zinc Co., and the Bronze Metal Products Co., La Salle, Ill., passed away recently. She was a graduate of the engineering school of the University of Wisconsin, and was known as a leading executive of the industry.

James E. Nagle

The firm of James E. Nagle and Sons, Inc., 2042 Hawthorne Ave., Toledo, Ohio, will be carried on by the four sons of the late James E. Nagle, whose death was reported in our August issue.

During the nine years in which they were associated with their father in business, they were constantly impressed with the dynamic energy and the untiring zeal with which he conducted his affairs. Their happy memories will be a most fruitful source of inspiration to carry on the business in the way in which he would have them do.

Robert J. Leighton

Robert J. Leighton, 62 years old, died recently following an illness of eight months. Mr. Leighton was secretary and treasurer of the William J. Gilbert Clock Corp., Waterbury, Conn.

Mr. Leighton was born in New York City on November 16, 1873, a son of Robert and Sarah (McKeag) Leighton. He entered the service of the Gilbert Clock Co. as a member of its clerical staff in New York City in 1897. He established his residence in Winsted in 1914.

He is survived by his wife, the former Miss Clara Merritt of Nyack, N. Y., a daughter, Mrs. Joseph E. Carey and one brother, Richard E. Leighton of New York City and three granddaughters.

Arthur N. Blanchard

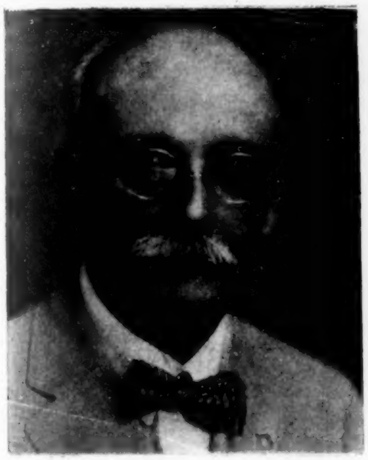
Arthur N. Blanchard, 63, president of the Milwaukee Metal Working Company, died suddenly of a heart attack recently at Berlin, Wisc., on his way home from a northern fishing trip.

Mr. Blanchard, who lived at the home of his father, Charles L. Blanchard, 2216 E. Kenilworth Place, was a lifelong resident of Milwaukee. He participated in the organization of the Milwaukee Metal Working Company, at 3159 N. 30th St., 35 years ago.

Mr. Blanchard is survived by his father, his sisters, Alice M. and Marjorie Blanchard.

Edward Weston

Dr. Edward Weston, famous inventor, who perfected the electric dynamo, died August 20th, in his home at 37 North Mountain Avenue, in Montclair, N. J., as a result of a cerebral hemorrhage suffered on his yacht, the Lorna Doone III, at New Bedford, Mass., on Tuesday.



DR. EDWARD WESTON

Dr. Weston was born in Shropshire, England, in 1850, and, although he showed marked aptitude for work in electricity, he began his career in medicine at the behest of his parents. Not until he had completed an interneship in London did he decide, against the objections of his parents, to revert from medicine to electrical science.

Upon the advice of a famous scientist, he came to America in 1870 at the age of 20 years. He spent two years in New York city as a chemist and electrician for industrial concerns, and in 1872 he established his own nickel-plating business.

In 1875 he became a partner in a concern manufacturing electric dynamo machines. The firm was incorporated as the Weston Company in 1877, and in 1881 it merged with the United States Electric Light Company. Dr. Weston relinquished his business affiliations in 1881 in order to devote all his time to research and development of electrical instruments.

As an inventor he held more than 200 patents on electrical devices. His most noteworthy work was his development of the dynamo, which, until he perfected it, was not commercial. Dr. Weston did not patent the dynamo, however. The Weston electric cell, patented in 1908, was accepted as the universal standard of electric-motive force.

In 1888 he returned to manufacturing, establishing the Weston Electric Instrument Company of Newark, makers of intricate and precise instruments. For seventeen years Dr. Weston was vice-president of the firm. He became its president in 1905 and retired in 1925, retaining, however, the chairmanship of the board of directors until his death.

A son, Edward F. Weston of Elizabeth, N. J., is the only survivor.

Albert B. Peck

Albert Bernard Peck, for nearly twenty years sales manager for the American Screw Company, Providence, died Sunday night, July 26 at the Homeopathic Hospital after being ill only since Wednesday, the 22nd. He was born in Bridgewater, Mass., May 8, 1876, the son of the late Albert Carpenter Peck and Catherine Elizabeth (Healey) Peck. He spent his boyhood in his native town and as a youth entered the employ of the American Screw Company, Providence, as a clerk, became salesman and sales agent and about twenty years ago became sales manager. He is survived by his widow, two daughters and two sons. He was a member of the Masonic fraternity, the Elks and Spanish War Veterans.

—W. H. M.

Proctor Carr

Proctor Carr, prominent business man died this morning, August 19th, after an illness of several months. He was 55 years old. Mr. Carr was vice president in charge of sales of the Buffalo Bolt Company at the time of death.

Born in Andover, N. H., the son of Clarence Edgar Carr and Carrie Emeline Proctor Carr, Mr. Carr prepared for college at Cambridge Latin School. He was graduated from Harvard in 1904.

He soon became secretary and sales manager of the United States Hame Company. Later he was vice president and sales manager for North & Judd Manufacturing Company of New Britain, Conn.

Ralph B. Manley

Ralph B. Manley of 220 Thornton Street, South Orange, president of the Abrasive Machine and Supply Company of Newark, died August 24th at the age of 56 in Orange Memorial Hospital, Orange, N. J.

Born in Ohio, Mr. Manley had resided in Newark for the last eighteen years. He was a Mason and a member of the Newark Athletic Club and the Advertising Club of New York. He leaves his widow, Lois; a daughter, a brother, Frank H. Manley of Niagara Falls, N. Y., treasurer of the Carborundum Company, and a sister, Mrs. William B. Lynch of Pasadena, Calif.

Metal Developments

A new "eyeglass" which is said to enable the human eye to detect traces of foreign substances in metals, is described in the daily press as having been developed at the **Massachusetts Institute of Technology,** Cambridge, Mass., by **Professor A. C. Hardy,** and now being used by **J. L. Michaelson** of the **General Electric Co.,** Schenectady, N. Y. This new "eyeglass" is a spectrophotometer, it is stated, suitable for use in a large number of industries.

Aluminum Co. of America, Pittsburgh, Pa., has increased the wages 5% for 20,000 employees. This is the second wage increase of 5% made by the company within 10 months.

Boeing School of Aeronautics in Oakland, Cal., reports a shortage of specialized sheet metal workers. Consequently, they have inaugurated a new Aircraft Sheet Metal Course designed to qualify its students for this type of work in airplane factories. It is stated that the Pacific Coast airplane plants now have nearly $30,000,000 in unfilled orders.

Timken Roller Bearing Co., Canton, Ohio, has designed and built a set of two 12 ft. main rods and four 9 ft. side rods for use with their bearings on heavy duty high speed steam passenger locomotives. These rods are chrome plated, heat treated alloy steel. The large rods required the construction of a specially designed chrome tank, 17 ft. long x 3 feet deep and 3 ft. wide. Current was supplied by a Timken equipped generator set capable of supplying 6500 amperes at 6 volts. Fumes

Corporation Earnings

Net Profit Unless Followed by (L) Which is Loss

	1936	1935
Akron Brass Co. (6 mo.)	$38,000	......
Aluminum Industries, Inc. (6 mo.)	49,468	34,999
Anaconda Copper Mining Co. (6 mo.)	5,827,425	5,214,882
Chapman Valve Co. (6 mo.)	129,341	......
Club Aluminum Utensil Co. (Year ended June 30)	1,260	12,242 (L)
Hobart Mfg. Co. (6 mo.)	423,601	328,866
International Nickel Co. of Canada, Ltd. (6 mo.)	17,456,974	10,338,242
F. L. Jacobs Co. (6 mo.)	325,794	......
National Battery Co. (Year ended June 30)	216,026	152,789 (10 mo.)
National Enameling and Stamping Co. (6 mo.)	80,552	94,011
New Jersey Zinc Co. (quarter ended June 30)	1,265,593	1,113,324
Walworth Co. (6 mo.)	80,537	219,550 (L)

were drawn off by a 7½ H.P. exhaust system capable of handling 12,000 cu. ft. of air per minute. Provision was made in this installation to salvage chromic acid from the fumes by washing them as they passed through the exhaust system.

Symposium on Welding

The American Society of Mechanical Engineers, 29 W. 39th St., New York City, will hold a Symposium on Welding, during the National Metal Congress in Cleveland, Ohio, October 22-23. Among the papers to be presented on non-ferrous metals are the following:

Application of Copper Alloy Welding, by **I. T. Hook,** American Brass Co., Ansonia, Conn.

Welding of Monel Metal and Pure Nickel, by **F. A. Flocke,** International Nickel Co., New York City.

Welding the Aluminum Alloys, by **G. O. Hoglund,** Aluminum Co. of America, New Kensington, Pa.

Metallurgical Laboratory Opening

The Parker-Kalon Corp., 200 Varick St., New York, held a formal opening of its new metallurgical and testing laboratory on July 30th. This extraordinarily well equipped laboratory comprises lathes, shapers, milling machines, drill, presses, grinders, special heat treating furnaces, physical testing machines for hardness, tensile strength, impact, etc. It is an outstanding example of the appreciation by manufacturers of the need for research in high grade manufacturing operations.

Scrap Metal Sale

The U. S. Naval Ammunition Depot, Lake Denmark, Dover, N. J., will hold a sale on September 22 of condemned materials, projectiles and scrap metals. All interested parties are invited to bid. Full details are contained in Catalog No. B-3-37, obtainable from the Supply Department, Building No. 3, 10th floor, Navy Yard, Brooklyn, N. Y., where the sealed bids will be publicly opened on September 22nd, 10:00 A. M. Dalight Saving Time. The results of the sale will be made known on September 29th.

Welding Clinics

Welding of non-ferrous metals will be demonstrated at two "clinics", which will be held in September in Buffalo and Cleveland. Demonstrations will be given of the most modern methods of oxy- and acetylene welding and brazing of copper, brass, bronze, aluminum, Monel, Inconel, etc.

The clinic in Cleveland, which will be held in the warehouse of Williams & Company, Inc., 1748 E. 22nd Street, on September 18 and 19, will be conducted by welding engineers of the International Nickel Co., Aluminum Co. of America, and the Revere Copper & Brass Co.

In Buffalo the clinic will be held in the warehouse of the Whitehead Metal Products Co. of New York, Inc., 254 Court Street, on September 25 and 26 by the International Nickel Co., Aluminum Co. of America and the American Brass Co.

In October similar clinics will be held in Montreal and Toronto Canada.

Business Items-Verified

Stebbins Engineering and Manufacturing Co., are now located at 363 Eastern Blvd., Watertown, N. Y.

Kelsan Products announce the removal of their plant and general offices to more commodious premises at 1015 South Sixth St., St. Clair, Mich.

Knight Screw Products Co., 6510 Epworth Blvd., Detroit, Mich., are purchasing a new building.

W. H. Hussey & Son, Inc., 233 W. 35th St., New York, plumbing equipment and supplies, will occupy 33,600 sq. ft. on the southeast corner of 11th Ave. and W. 42nd St., for new storage and distributing headquarters, with pipe department and other mechanical divisions.

Bell Aircraft Corp., 2050 Elmwood Ave., Buffalo, N. Y., manufacturers of airplanes and parts, occupying part of former plant of **Consolidated Aircraft Corp.,** are arranging for the lease of 65,000 sq. ft. additional space, making total plant area of 145,000 sq. ft., for expansion in parts production and assembling departments. Company has authorized financing to total about $500,000, considerable part of this fund to be used for purposes noted.

Keystone Aluminum Die Casting Co., 1410 Morris Bldg., Philadelphia, has been dissolved. **S. J. Henderson,** 1400 S. Penn Sq., represents the firm.

National Casket Co. Inc., executive office, 60 Massachusetts Ave., Boston, Mass., have under way construction of a new building for their Albany sales branch. This building will be used for show room and storage of stock, and will be three stories and basement, with up-to-date facility for conducting business. Cost over $150,000.

Arnold Haviland Co., Jackson Ave., Defiance, Ohio, are constructing a building containing 10,000 sq. ft. of floor space. The company manufactures metal stampings. The following department is operated: stamping.

Truck Equipment Co., 1791 Fillmore Ave., Buffalo, N. Y., have leased a one-story building at 37th St., L. I. City, N. Y., comprising about 10,000 sq. ft. of floor space. It will be occupied as a factory branch, service and distributing works. The company machines bronze castings and does a fair amount of grinding. The following departments are operated: brass machine shop, tool room and grinding. Truxmore Third Axle, Truxmore semi-trailer, and gravity spring suspension systems are the major products of this company.

The **Wendell August Forge** Co., Grove City, Pa., have received a contract to furnish and install hand-forged aluminum gates for the baptistry of the Queen of the Holy Rosary Cathedral, Toledo, Ohio, now under construction at a cost of several millions of dollars. The firm holds basic patents on process for forging aluminum. A hand forged metals department is operated.

Camden Metal Works, Camden, N. J., have been incorporated with capital of $125,000.

The **Hydrau Hinge Corp.,** Providence, R. I., have been incorporated to manufacture hinge and metal equipment. Capital 120 shares of capital stock without par value; incorporators: **Samson Nathanson, Christine M. Nanni** and **Virginia W. Allen.**

Corcoran-Brown Co., 4890 Springgrove Ave., Cincinnati, Ohio, have received a permit to erect a brick and steel addition at a cost of $50,000. The company manufactures lamps and auto equipment, and operates the following departments: tool room, spinning, stamping, polishing and buffing, electroplating, lacquering, japanning and enameling.

Due to the necessity for expanding the production facilities of its Springfield, Mass., works in merchandising lines, particularly refrigeration and air conditioning units, the **Westinghouse Electric and Mfg. Co.,** East Pittsburgh, Pa., announce that they will transfer the manufacture of small motors now manufactured at their Springfield plant at Lima, Ohio. The plant was formerly owned by the **Relay Motors** Corp., Lima. Installation of machinery required for the manufacture of small motors will be started immediately. It is expected that motor production may be started in the new factory by the first of the year. The plant will be under the direction of **R. F. Frenger,** manager of the small motor division of the company.

Jessen Manufacturing Co., 1409 W. Beardsley Ave., Elkhart, Ind., are constructing a 38 x 64 foot addition. The company manufactures screw machine products in brass, bronze, steel and Monel metal. The following departments are operated: brass machine shop, tool room and grinding.

Shure Katch Fishing Tackle Co., have negotiated for the removal of plant and equipment from Providence, R. I., to the former plant of the **Utica Knitting Co.,** Richfield Springs, N. Y. Manufacturing operations will be started early in the Fall. This firm operates the following departments: lead smelting and brass machine shop, lead casting shop, lacquering and enameling.

Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., have been granted a patent covering their radio active treatment of fire hose. Patent number is 2,045,738.

The **Brown Instrument Co., Division of the Minneapolis-Honeywell Regulator Co.,** Philadelphia, Pa., will have an exhibit at the National Metal Exposition, October 19-23, in Cleveland, Ohio, which will include indicating, recording and automatic control instruments used in the production, fabrication and heat treatment of metals, such as pyrometers, flow meters, thermometers, pressure gages, liquid level meters, pressure controllers, combustion safeguard equipment and several types of motor operated valves.

General Electric Co., Schenectady, N. Y., announce the withdrawal of Hotpoint refrigerators and Hotpoint home laundry equipment from their appliance lines. The **Edison General Electric Appliance Co.,** Chicago, Ill., have been reorganized as a company acting independently in the specialty appliance field, and will assume responsibility for these products in addition to Hotpoint ranges, water heaters and dishwashers.

American Brass Co., Waterbury, Conn., will display a selection of high strength copper alloys at the National Metal Congress and Exposition in Cleveland, October 19-23. These will include Everdur metal, beryllium copper, Tempaloy, Tobin bronze and various phosphor bronze alloys. They will be shown in commercial and fabricated forms. An interesting feature of this exhibit will be a welding demonstration booth, where an Anaconda welding engineer will demonstrate all types of welding with bronze rods and will also show long arc, high voltage welding on copper.

Lincoln Electric Co., announce the change of their San Francisco office from 894 Folsom St., to 866 Folsom St. The new quarters have 50% greater space than the previous location.

Detroit Rex Products Co., 13011 Hillview Ave., Detroit, Mich., have obtained additional quarters and increased their manufacturing facilities. New equipment is now being purchased and installed to facilitate the production and delivery of standard and special designs of Detrex degreasers.

Meriam Co., 1955 W. 112th St., Cleveland, Ohio, are now completing a new addition to their present plant, 100 ft. long x 54 ft. wide. A special spur track will run into the building itself to provide increased facilities for handling heavy engines and parts for the welding division.

American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York, have assembled an interesting and instructive exhibition of metallic elements present in the earth's crust, their availability, the locations of commercial sources and the flow of metals and minerals in world trade, which will be on view from August 17th to October 18th at the Metal Products Exhibits, International Building, Rockefeller Center, New York.

The **W. W. Sly Manufacturing Company,** 4700 Train Avenue, Cleveland, Ohio, manufacturers of foundry cleaning room equipment, sandblast equipment and dust control equipment, have appointed **Alexander Haigh** of 141 Milk Street, Boston, Mass. as their representative for the New England States.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

August 21, 1936.

Employment in all factories of the city employing 65 or more was 32,586 in July, an increase of 625 as compared with June and an increase of 3,968 as compared with July last year. The figure is only 2,812 less than that in July, 1929 which was the high peak of the period since the war. In the eight largest factories 17,393 persons were employed in July, an increase of 317 over June and of 2,378 over July, 1935. Bank clearings in July were $6,638,500, an increase of $1,225,000 over July last year but a decrease of $498,000 from the previous month.

John H. Goss, vice president of the **Scovill Mfg. Co.** said last month that the usual summer slump in the brass business, which begins in July and lasts until October has not been experienced this year but, on the contrary, each month of the summer has seen an increase in business.

The **Waterbury Clock Co.** employees are now working 48 hours a week, which is more than they were working a year ago. **Supt. C. H. Granger** says that Fall orders have arrived a month earlier than usual and production is nearing the 1928 level.

The **Lux Clock Co.** is building a $100,000, four-story addition and according to **Secretary Herman Lux** it will put on 300 new employees when it is completed. It now has over 600 employees.

The **American Brass Co.** is building a small addition to its West branch and the **Waterbury Buckle Co.** is erecting a small addition.

The **Shoe Hardware Co.** has notified all employees that, beginning in 1937, all who have been employed for one year, will receive one week's vacation with pay equal to two per cent of their earnings for the prior twelve months. This applies to every wage earner in the plant. Other factories are said to be considering similar measures.

Anthony Shaknaitis of this city was given a month in jail last month when convicted of stealing copper and brass from the **Thinsheet Metal Co.** and selling it for scrap. He had been employed by the company for several years.

—W. R. B.

Connecticut Notes

August 21, 1936.

HARTFORD — Construction started this month on the new factory building of the **Holo-Krome Screw Corp.** The site comprises 10 acres with 700 feet of railroad frontage. The concern will move its equipment from Bristol when the factory is completed. It will be of brick and steel, of the saw tooth type of mill construction.

NEW BRITAIN—The **New Britain Machine Co.,** which has owned a majority interest in the **New Britain Gridley Co.** for some years, has acquired the minority interest and the corporate identity of the **Gridley Co.** will be dissolved.

Landers, Frary & Clark has let a contract for rebuilding the old dam in New Hartford, which was washed out by the flood last spring, to the **Blakeslee Co.** of New Haven.

BRIDGEPORT — The **Bridgeport Brass Co.** has purchased the property

of the **Karm Terminal Co.** and will erect a rolling mill there almost as large as its present mill.

MERIDEN—The 25 principal plants in this city worked a weekly average of 221,570 man-hours in June, compared with 202,024 for June last year. Employment totalled 5,693, compared with 5,320 last year and payrolls averaged $124,573 a week compared with $115,-943 last year.

The **Handel Co.**, which has been closed for over a year, has sold its machinery, dies, moulds, patents and equipment to **Edward Krock** of Worcester. What use will be made of them is not known.

WINSTED—The **William L. Gilbert Clock Co.** now has 400 employees and is operating on a full time basis, enjoying the best business of any time since 1928.

NORWALK—The **Segal Lock & Hardware Co.** reported unfilled orders on August 1 of $502,700 against $159,200 a year ago. Sales and shipments so far this year are 39 per cent ahead of the same period last year.

The **Norwalk Lock Co.** plans to build a three-story addition, 28 by 65 feet.

SOUTHINGTON—The **Southington Hardware Co.** is now working five eight-hour days a week and employing 160 persons. Sales for the year ending June 30 showed an increase of 30 per cent over the past year.

BRISTOL—The plant of the **New Departure Mfg. Co.** was closed for one week in July for inventory and repairs. The company is now employing 4,000.

ANSONIA—The **American Brass Co.** is building a new shipping department plant and an extension of the extrusion rod department here at a cost of about $30,000 on land gained by changing the course of the Naugatuck river.

—W. R. B.

Providence, R. I.

August 24, 1936.

There were slight improvements in the various branches of the manufacturing jewelry and silverware industries, non-ferrous metals, hand tools and machinery in Rhode Island during the month of July as compared with the corresponding month of last year, according to the announcement of the **Brown Bureau of Business Research** as to the amount of payroll withdrawals for the month, released a few days ago.

The **Monowatt Electric Corporation,** a subsidiary of the **General Electric Company,** is transferring its entire manufacturing operations from Bridgeport, Conn., to Providence, where the equipment will occupy the plant of the old **D. and W. Fuse Company** on Hathaway Street, which will be ready for operation by October 1. Employment eventually will be provided from between 500 and 600 persons in the manufacture of the wiring devices that constitutes this company's products. The **General Electric Company** already has one subsidiary plant here—the **Providence Base Works**—where between 400 and 500 persons are employed in the production of incandescent lamp bases. Permits were recently granted for alterations at the Hathaway Street plant involving an expenditure of several thousand dollars preparatory to the installation of the **Monowatt Corporation's** equipment.

General Plating Works, Inc., of Pawtucket has been granted articles of incorporation under the laws of Rhode Island, with an authorized capital consisting of 100 shares of common stock of no par value. The incorporators are: **Maurice, Arnold E.** and **Gertrude Friedman,** all of 76 Olive Street, Providence.

Frank J. DeBisschop, general manager of the **United Wire & Supply Company** was the recipient of a silver loving cup at the annual outing of the employees of that concern at Rocky Point on Narragansett Bay, on Saturday, July 25. More than 300 persons participated in the outing which included a ten-mile automobile ride, athletic games, field sports, bathing, shore dinner and dancing.

A. J. Lewis has been appointed district manager for the Detroit district for the **American Emery Wheel Company** of Providence. **Mr. Lewis** has been engaged in the grinding wheel business for many years, for the past fifteen years in the State of Michigan.

Upon the petition of **Mrs. Bertha C. Culbert** and **John C. Culbert,** president and treasurer-general manager respectively, a hearing was held August 7 by **Judge Mortimer A. Sullivan** in Superior Court for Providence County and **Chester A. Boynton** appointed receiver; and for the dissolution as a corporation of The **Pawtucket Smelting & Refining Works,** of 408 Mill Street, Central Falls. The petitioners claim that the corporation owes considerable sums to creditors and is insolvent and asks for a receiver to continue the business until it can be disposed of advantageously. The business was incorporated under the laws of Rhode Island in 1911 with an authorized capital of $100,000 to conduct the business of smelting and refining of gold, silver and copper.

The **Service Brass Foundry,** 129 Liberty Street, Central Falls is owned and conducted by **Joseph Ransden,** according to his statement filed at the City Clerk's office.

Michael Chernow of 46 Chestnut Street, **Mollie Chernow** and **Francis Gold** are named as the incorporators of two concerns that have been granted charters under the laws of Rhode Island to conduct manufacturing jewelry businesses with authorized capitals of $50,-000 each consisting of 5,000 shares at $10 each. The two concerns are **S. T. Jewelry Inc.,** and **Five Star Jewelry Inc.**

—W. H. M.

Middle Atlantic States

Utica, N. Y.

Aug. 21, 1936.

Metal manufacturing activity in Central New York is more encouraging at this time than it has been in a number of months.

The **Williams Steel Wheel & Rim Company,** Utica, which reports it is one of the two large concerns in this country which manufactures wheels and rims for bicycles is enjoying a rush business. The world wide increase in bicycle manufacturing is reflected in the work at this factory where the plant is working 20 hours a day and the executives report they are unable to keep abreast of the orders. In Little Falls the **Homer Snyder** bicycle factory is reported to be working night and day. From this factory it was learned that 750,000 bicycles were made in the United States last year but that present demand reveals that more than 1,000,000 will be made in 1936.

Bossert Corporation, Utica, continues its brisk business of making automobile parts, a number of employees having been added to the staff.

After a short hot weather shutdown the **Richardson & Boynton Company** foundry at Whitesboro resumed operations Aug. 17. The foundry which makes furnaces and heating equipment is operating on a five day schedule. The plant employs about 150 men.

The **International Heater Company,** Utica, is shipping extensively into the midwest territory. A number of carloads will go into Illinois.

H. J. Brandeles Corporation, Utica, is busy installing electrical refrigeration units in the Central New York area. The corporation has done extensive electrical installation this year in Rome, Auburn, Poland and Holland Patent.

—E. K. B.

Newark, N. J.

August 21, 1936.

The **General Alloy Co., Inc.,** has leased buildings on New Jersey Railroad Avenue to accommodate its wire division. Machinery for the manufacture of fine wire is being set up at the new quarters. The firm maintains a modern laboratory and diamond-cutting department and machines for reconditioning dies used in the manufacture of wire. The company has been in the precious metal business for the past twenty years.

Clem Co., Inc., of 62 East Bigelow Street, manufacturers of lighting fixtures, has leased for a number of years a plant on Jelliff Avenue to take care of increased business. **Sheffield Mfg. Co.,** makers of razor blades, of Irvington, has leased larger quarters in Newark. New machinery will be installed and extra hands added. **Eric Johnson Forging Works** will erect a new plant to cost $37,000. New machinery has also been ordered.

—C. A. L.

Trenton, N. J.

August 21, 1936.

The **Trenton Container Co.,** has leased a plant in Trenton for the manufacture of all types of corrugated shipping containers. **Roy W. Williams,** is president of the new firm, and **E. E. Gaus,** secretary and treasurer. Both have been affiliated for twenty years with the **Container Corporation of America** with home offices in Chicago. The company has plants in various sections of the country.

The **State Labor Department** reports a large increase in labor at various New Jersey manufacturing plants with an increase of nearly $12,000 weekly in wages for the month of June.

Application for an injunction and a claim for damages has been filed in the United States District Court by the **John A. Roebling's Sons Co.,** against the **American Bridge Co.,** of New York. The plaintiff alleged that the **American Bridge Co.** is infringing on certain patent rights which the **Roebling** firm claims were assigned to it in March, 1933, by **Charles C. Sunderland,** inventor. The patent involves methods and apparatus used in the construction of bridges.—**C. A. L.**

Middle Western States

Toledo, Ohio

August 21, 1936.

Following the trend of other industrial areas along the Great Lakes, Toledo's mid-summer industrial decline promises to be of much shorter duration than in other years.

Plants allied with the motor car industry already are retooling and getting in shape for a greatly increased production program. Other manufacturers also are preparing for the best fall and winter business they have had in many years.

The plating plants, which figure prominently in many lines, here are being prepared for an early revival of production, as the coming season demand is expected to be heavy from the start.

Owing to the new order of things, unskilled labor does not have an encouraging outlook. There are, however, ample opportunities for the skilled mechanic. This is true of every other industrial section along the Great Lakes.

Announcement is made that thirteen large machinery and tool plants here are unusually busy with orders from factories throughout the world which have begun replacement programs.

The Chevrolet plant here closed on Aug. 4, for four to six weeks for the annual inventory and plant rearrangement. It is expected operations will be resumed near the end of September with more vigor than ever.—**F. J. H.**

Detroit, Mich.

August 21, 1936.

Extensive preparations are under way all through this area for an early resumption of fall production. Many of the big plants are closing just long enough for inventory and retooling for the new things to go on the market early in the fall.

This procedure is more pronounced with the motor car manufacturers who predict the greatest production volume they have undertaken since before 1929. Refinements in the 1937 motor cars will show much in the way of non-ferrous metals. Plants furnishing accessories already are scrambling to get in shape to meet demands expected to be pressing at the start of operations.

Manufacturers of refrigeration units have shown little production decline since early spring and nothing but steady increases seem apparent for an indefinite period.

Plumbers' supplies will be produced here this fall in greater volume than at any time during the last several years. Many of the plants are active in spite of the mid-summer dull period.

The fact that the Detroit area faces no labor controversy, leads every one to believe that the coming fall and winter will show the greatest production volume that has been recorded in a long time.

Announcement is made that an order has been received by the **Continental Motor Car Co.** for 1,050 four-cylinder opposed type aircraft engines from the **Taylor Aircraft Co.,** at Bradford, Pa. The Continental is still busy on an earlier contract from the Taylor organization, it is stated. According to **William R. Angell,** the Continental president, his plant will materially increase production during the fall and winter as a result of an increase in new business.

Arthur L. Blakeslee, president of the **Kalamazoo Stove Co.,** announces that employment figures of his organization have reached the highest levels in its history. More than 1,100 persons are now on the payroll. Orders booked during the first half of the year showed a gain of 45 per cent.

The **Eaton Manufacturing Co.,** it is understood, plans for an expenditure of $40,000 on improvements on its plant at Jackson, Mich. At the same time it is stated that the organization expects to transfer its stamping operations from Detroit to Massillon, O. At Jackson new buffing lathes, power grinders and conveyor system for handling bumpers, are being installed.

The **Daisy Air Rifle Company,** at Plymouth, Mich., it is announced, has awarded a contract for the construction of an addition to its plant.

More than $100,000 will be expended during the next three months by the **Norge Corporation** for expansions and improvements to its plant at Muskegon Heights, according to **Harry L. Spencer,** plant manager. The program, it is stated, includes additional machinery, extensive alterations and improvements in some of the departments.

The **Olds Motor Division** of the **General Motors Corpn.,** it is reported, plans a $6,350,000 expansion of its production facilities within the next six months. Announcement is made that the organization recently produced its two-hundred thousandth 1936 model.

The **Mueller Brass Company,** at Port Huron, manufacturers of castings and tubing has asked for bids, it is stated, for a $50,000 plant addition and $20,000 worth of other improvements.

As a result of the addition of an electric washer and an electric ironer to its line of household appliances, two new departments have been organized by the **Kelvinator Corporation** at Detroit, it is announced. Accelerated activity in its electric range production also is assured, according to **H. W. Burritt,** vice president in charge of sales, making it increasingly necessary for these two new departments.

The **Knight Plating Co.** has recently been incorporated in Detroit by **Albert F. Camin,** 3143 Bellevue Avenue. The capital stock is stated to be $5,000.

Detrola Radio & Television Corp., of Detroit, has started production at the rate of about 1,200 sets per day, it is stated an increase of about 50 per cent over any period in the organization's five and one-half years' history. **John J. Ross,** president, says that unfilled orders amount to more than $300,000.

—**F. J. H.**

Pacific States

Los Angeles, Calif.

August 21, 1936.

The **Rulo Gas Saver Co.,** making gas savers and automatic injectors, have moved to Wilshire Blvd., **P. H. Lamoreaux** at the head.

The **O'Keefe Merritt Co.,** 3700 East Olympic Blvd., are building another unit for the building of circulating heaters. Their factory now covers seven acres and the enameling plant has been doubled in size.

The **Gaffers & Sattler Co.,** 4561 East 50th St., are completing a large addition to the plant, making stoves and ranges.

The **Stevens Metal Products Co.** of Niles, Ohio, making steel barrels, kegs, drums, casks, etc., have appointed as their representative on the coast, **G. C. Sutton** of 325 Beaux-Arts Bldg. These barrels have a high temperature enamel lining baked on at 500 deg. F.

The **Bishop & Babcock Co.** of Cleveland, Ohio, making brass goods for brewers and liquor stores, have appointed **R. E. Spriggs** of 833 South San Pedro St., as their district representative.

The **Metalite Mfg. Co.** of 1114 West Washington Blvd., have got actively in the line of making coffee filtering devices of aluminum.

The **Meadows Mfg. Co.** of Bloomington, Ill., making electric washing machine equipment, have opened a Pacific Coast office, here at 1629 South Hill St., in charge of **Herbert H. Horn.**

The **United American Bosch Corp.** of Springfield, Mass., making a new one-piece car radio, all electric, are now represented here by the **Magneto Sales & Service Co.** and by **Featherstone.**

The **Shelby Cycle Co.** of the east, have opened a branch factory here, at 1011 South Los Angeles St., in charge of **George L. Evans.**

The **Leviton Mfg. Co.** of Brooklyn, N. Y., making electric wiring devices, have opened here a wholesale establishment for the coast at the Stewart-Dawes Bldg., 8th and Santee Sts.

—H. S.

North Pacific

August 21, 1936.

The **Ray Burner Co.,** 401 Bernal Ave., San Francisco, are making several new kinds of automatic burner.

The **B. W. Norton Mfg. Co.** of 3078 East 10th St., Oakland, are rebuilding their factory which burned, for making all metal goods.

The **International Nickel Co.,** 67 Wall Street, New York, are now represented on the Pacific Coast, by **Pacific Marine Supply Co.,** Seattle; **Marine Hardware Co.** and **C. J. Henry Co.** of San Pedro, Calif.; **Young Bros.,** Honolulu; **Weeks, Howe & Emerson Co.** and **Johnson & Joseph,** San Francisco.

The **Eagle Woodenware Mfg. Co.** of Hamilton, Ohio, are now going strongly into the manufacture of steel and other metal pails. They have appointed as representatives on the Coast, **Gillette & McLaren,** Seattle and Portland; **Omer Cox Co.,** San Francisco and Los Angeles.—**H. S.**

Metal Market Review

August 24, 1936.

SALES of **Copper** for July reached the record high 175,484 tons, in which 147,928 tons were for October delivery. The reason for this extraordinary total was the fact that foreign copper had been extremely active, and its price had risen until it almost reached the price ot American copper. This should have forced another rise here, presumably, to ten cents, but one of the leading American producers stood firm, insisting that it was better to make larger sales at lower prices than to raise prices to the point where marginal producers could go into the market with their metal, and also where copper would feel competition of other materials like aluminum. Consequently the price of copper in August did not change, remaining at 9.75 cents per pound for electrolytic, delivered Connecticut Valley.

Foreign producers who are participating in a curtailment agreement will increase operations 5 per cent bringing their rate to 75 per cent of capacity. Kennecott will increase domestic production about 3000 tons per month beginning with September and it is likely that American output will be augmented to the extent of about 10,000 tons a month this Fall.

Sales of copper during the past three weeks were 2,269 tons, 4,644 tons and 12,466 tons. At the time of writing foreign demands seem to be growing to a large scale on the basis of 9.60c c.i.f.

Zinc was unchanged in quotation, remaining steadfast at 4.80c per pound, Prime Western, East St. Louis. The undertone was steady with consumers showing good interest in the market. This was unsettled somewhat by the news that negotiations for an international zinc cartel had been broken off, but the price remained firm neverthless, and producers seem to be encouraged by the favorable character of reports on actual consumption of the metal. Sales for the past three weeks were fluctuating but totaled about 10,000 tons.

Tin see-sawed back and forth between 43 and 42 and is quoted at this time at 42.25c per pound Straits. Uncertainty was caused by the difficulty among producers in settling their quotations, with special reference to Siam. Final agreement is not generally expected until somewhat later in the year, and a consistent policy or a consistent market is hardly to be expected until then.

Total consumption of primary tin in the U. S. during the first half of 1936 was 32,680 long tons against 32,150 long tons in the same period of 1935.

Lead was a steady performer, remainin at 4.45c per pound, F.O.B. St. Louis. The market was firm and the demand for metal brisk throughout the last four weeks. Sales have averaged above 11,000 tons per week during the past 8 weeks, the major buying confined to battery, tin foil, pigment, sheet lead and pipe interests, with cable makers beginning to show real interest.

Silver—steady, inactive and unchanged at 44.75c per ounce.

Platinum took the lead during August for gyrations. During July it had risen to $37, and it continued this climb, going up to $40 per ounce, where it remained without change for about two weeks. Suddenly, however, it rose overnight to $53. This rise coincided with a meeting of the platinum interests abroad, and for lack of any other reason, the rise was attributed to the so-called "cartel." Such manipulation by a cartel (which in the first place has been for a long time inoperative and in the second place would hardly, even if operative, carry on in such fashion) was doubted by most informed observers. A leading London firm voiced its distaste and disavowed any responsibility for the market, claiming that the rise was forced by heavy demands from speculators, principally in the U. S. The immediate future is obviously uncertain.

Scrap Metal naturally took up some of the tenseness of the primary copper market. During the last week in July scrap copper was offered in improved volume although still in limited quantities. It continued through August to hold firm with only fair offerings, but became tighter as the month wore on, especially since export scrap copper bids jumped above domestic prices.

At this time offerings are light. Brass and aluminum ingot were steady at the beginning of August but orders were not over-plentiful. A heavy back log exists, however, 25,289 tons among the members of the Non-Ferrous Ingot Metal Institute on August 1st, and deliveries are holding up rather well. Aluminum ingot prices are steady to firm.

Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on Commercial Grades of six principal mixtures of Ingot Brass during the twenty-eight day period ending August 7.

80-10-10 (1½% Imp.)	10.809c
78% Metal	8.579c
81% Metal	8.753c
83% Metal	9.008c
85-5-5-5	9.286c
No. 1 Yellow Brass	7.542c

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for the month of July, 1936, amounted to a total of 6,339 tons.

The **Wrought Metal Market** continues to behave in very satisfactory fashion. The Waterbury mills are operating at the highest rate since 1929, at the present time employing 92 per cent of the number employed in 1929. The excellent rate of automobile operations has also reacted to the advantage of the western mills. A metropolitan distributor reports that business in August is 10% ahead of July, and 20% ahead of August of 1935.

AVERAGE PRICES FOR METALS

	JULY
Copper c/lb. Duty 4c/lb.	
Lake (del. Conn. Producers' Prices)	9.659
Electrolytic (del. Conn. Producers' Prices)	9.596
Casting (f.o.b. ref.)	9.248
Zinc (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05)	4.787
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	42.968
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.450
Aluminum c/lb. Duty 4 c/lb.	20.500
Nickel c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.00
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	13.000
Silver c/oz. Troy, Duty Free	44.750
Platinum $/oz. Troy, Duty Free	36.265
Gold—Official U. S. Treasury Price $/oz. Troy	35.00

Metal Prices, August 28, 1936

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.875, Electrolytic, 9.75, Casting, 9.40.
Zinc: Prime Western, 4.80. Brass Special, 4.90.
Tin: Straits 42.875.
Lead: 4.45. **Aluminum,** 19-22. **Antimony,** 12.50.
Nickel: Shot, 36. Elec., 35.

Quicksilver: Flasks, 75 lbs., $80. **Bismuth,** $1.00. **Cadmium,** 75c to $1.00. **Silver,** Troy oz., official price, N. Y., Aug. 28, 44.75c. **Gold:** Oz. Troy, Official U. S. Treasury price, Aug. 28, $35.00. **Scrap Gold,** 63¼c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $62.00.

Duties: Copper, 4c lb.; zinc, 1¾c. lb.; tin, free, lead, 2⅛c. lb.; aluminum, 4c lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U S. Import Duty	Tax*
No. 1 Yellow Brass	8.00	None	4c. lb.[1]
85-5-5-5	9.75	None	4c. lb.[1]
88-10-2	13	None	4c. lb.[1]
80-10-10	11¼	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	10.00	None	4c. lb.[1]
Aluminum Bronze	14.25	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	12.00	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	14.25	20% a. v.	4c. lb.[1]
No. 12 Aluminum	16.50-20	4c. lb.	None
Manganese Copper, Grade A (30%)	18-23	25% a. v.	3c. lb.[1]
Phosphor Copper, 10%	12-14	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	13.25-15	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	18-30	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	49-75	None	None
Iridium Platinum, 5% (Nominal)	$56.00	None	None
Iridium Platinum, 10% (Nominal)	$59.00	None	None

* Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:

	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed.	7⅜ to 7½	Free	4c. per pound on copper content
Light copper	6⅜ to 6½	Free	
Heavy yellow brass	4¼ to 4⅜	Free	
Light brass	4 to 4⅛	Free	
No. 1 composition	6 to 6⅛	Free	
Composition turnings	5⅞ to 6	Free	
Heavy soft lead	3.90 to 4	2⅛c.lb.	None
Old zinc	2½ to 2⅝	1½c.lb.	
New zinc clips	3½ to 3¾	1½c.lb.	
Aluminum clips (new, soft)	13½ to 14	4c.lb.	
Scrap aluminum, cast	11½ to 11¾	4c.lb.	
Aluminum borings—turnings	6 to 6¼	4c.lb.	
No. 1 pewter	28 to 29	Free	
Electrotype	4 to 4⅛	2⅛c.lb.*	
Nickel anodes	26 to 27	10%	
Nickel clips, new	33 to 35	10%	
Monel scrap	8½ to 15	10% av.	

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since July 22, 1936. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	17¼c.	2½c. lb.
Bare wire, soft, less than carloads	13½c.	25% a v.
Seamless tubing	17¾c.	7c. lb.

* Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	24⅝c.	10% Quality	27¼c.
15% Quality	26¾c.	15% Quality	31⅝c.
18% Quality	28 c.	18% Quality	34⅞c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.80
Aluminum coils, 24 ga., base price, ton lots, per lb.	30.50

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	49c.	Cold Rolled Sheet	53c.
Hot Rolled Rods	44c.	Standard Sheet	48c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	.34	Standard Sheets (base)	.38
Cold Drawn Rods (base)	.39	Cold Rolled Sheets (base)	.43

SILVER SHEET

Rolled sterling silver (Aug. 28) 47c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	U. S. Import Tax
Sheet	15⅜c.	16¼c.	17⅛	4c. lb.	4c. lb. on copper content.
Wire	15⅝c.	16½c.	17⅜	25%	
Rod	13⅜c.	16½c.	17¼	4c. lb.	
Angles, channels.	23⅛c.	24¼c.	24⅞	12c. lb.	
Seamless tubing..	17⅝c.	18¼c.	19⅛	8c. lb.	
Open seam tubing	23⅛c.	24¼c.	24⅞	20% a.v.	

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.; import tax 4c. lb. on copper content.)

Tobin Bronze Rod	17¼c.
Muntz or Yellow Rectangular and other sheathing	18⅝c.
Muntz or Yellow Metal Rod	14¾c.

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	8.00	2⅜c. lb.
Cut Lead Sheet (base price)	8.25	2⅜c. lb

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 368.

Supply Prices, August 28, 1936

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper:	Cast	17 c. per lb.
	Electrolytic, full size, 15c. cut to size	15 c. per lb.
	Rolled oval, straight, 15½c.; curved	16½c. per lb.
Brass:	Cast	17½c. per lb.
Zinc:	Cast	10⅛c. per lb.

Nickel:	90-92%	.45 per lb.
	95-97%	.46 per lb.
	99%+cast, 47c.; rolled, depolarized, 48.	

Silver: Rolled silver anodes .999 fine were quoted Aug. 28, from 48c. per Troy ounce upward, depending on quantity.

WHITE SPANISH FELT POLISHING WHEELS

Even Diameters	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.35/lb.	$2.23/lb.	$2.12/lb.
10-12-14 & 16	2 to 3½	2.35	2.23	2.12
6-8 & 18	1 to 2	2.35	2.23	2.12
6-8 & 18	2 to 3½	2.35	2.23	2.12
Over 18	Under ½	3.80	3.61	3.42
Over 18	½ to 1	3.45	3.28	3.11
Over 18	Over 3½	2.80	2.66	2.52

Odd Diameters

Less than 50 lbs.—add 40c. per lb. to "Even Diameters" list. 50 lbs. or over—all one size and consistency and in one shipment—same as "Even Diameters."

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick. On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$71.13
14" 20 ply 84/92 Unbleached	54.58
12" 20 ply 84/92 Unbleached	41.09
16" 20 ply 80/92 Unbleached	59.37
14" 20 ply 80/92 Unbleached	45.64
12" 20 ply 80/92 Unbleached	34.45
16" 20 ply 64/68 Unbleached	51.26
14" 20 ply 64/68 Unbleached	39.47
12" 20 ply 64/68 Unbleached	29.86
⅜" Sewed Buffs, per lb., bleached or unbleached	48c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.09½-14½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 400 or 100 lb. drums		.16¾
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.029
Alcohol—Butyl, drums	lb.	.09½-.12
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.03½
Powdered, barrels	lb.	.0340-.0365
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0245-.0295
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.05
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	.21½-.23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.26
Carbonate, 53/55% cu., bbls.	lb.	.15½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	.04½-.05
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¾-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium		$15.45
*Gold Cyanide, Sodium		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016

*Subject to fluctuations in metal prices.

Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.08-.11
Lime Compositions for Brass	lb.	.08-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09
Carbonate, 96-98%	lb.	.07⅜
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.38
Cyanide, 100 oz. lots	oz.	.46-.50
Nitrate, 100 ounce lots	oz.	.32¾
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	2.55-3.15
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.29½-.32½
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.35
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow. No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.37-.38
Chloride, drums, bbls.	lb.	.06
Sulphate, bbls.	lb.	.033